223

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CONTENTS

TRADE NAME	MODEL	SET AND FOLDER NO.
Aircastle	472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.7, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D) Tel. Rec.	223-2
Arvin	760T (Ch. RE342)	223-3
CBS-Columbia	515A, 516A, 517A	223-4
Crosley	F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, CDLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU Tel. Rec.	223-5
Eicor	230 Recorder	223-6
Firestone	4-B-72	223-7
Philco	A-T1818, A-T1858, A-T2233, A-T2234, A-T2266, L, A-T2271HM, A-T2274S, A-2277S, A-T2280, A-T2281, A-T2288HMS, S, A-T2289, A-UT1818, A-UT1858, A-UT2233, A-UT2234, A-UT2266, L, A-UT2280, A-UT2281, A-UT2289 (Code 128) (Ch. 91A, J-2, 53-T1827, F, HM, 53-T1853, L, 53-T228, 53-T2266, L, 53-T2269, 53-T2270, 53-T2271, 53-T2273, C (Code 128) (Ch. 91, J-2), 53-U1827, HM (Code 126) (Ch. 91, J-1), 53-U1827 (Code 128) (Ch. 91, J-2), 53-U1853, L, 53-U2266, L (Code 126) (Ch. 91, J-1), 53-U2266 (Code 128), (Ch. 91, J-2), 53-U2269, 53-U2271 (Code 126) (Ch. 91, J-1), 53-U2271 (Code 128) (Ch. 91, J-2) Tel. Rec., Prod. Chg. Bul. 82	223-1
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Philco	UT-21A, B UHF Tuner	223-9
Pilot	PA-912	223-10
Steelman	151M	223-11
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Travler	5300	223-13
Zenith	L1812E, R, L1820E, R (Ch. 19L26), L2229E, R, L2235E, R (Ch. 19L28) Tel. Rec.	223-14

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 10 IN SET 185

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DENVER, COLORADO

MODEL	CODE	RF CH.	DEFL.CH.	UHF CONV.	CRT
A-1818	128	91A	J-2		17YP4
A-T1858	128	91A	J-2		17YP4
A-T2233	128	91A	J-2		17YP4
A-T2234	128	91A	J-2		17YP4
A-T2266, L	128	91A	J-2		17YP4
A-T2271HM	128	91A	J-2		21EP4A
A-T2274S	128	91A	J-2		21EP4A
A-T2277S	128	91A	J-2		21EP4A
A-T2280	128	91A	J-2		21EP4A
A-T2288HMS, S	128	91A	J-2		21EP4A
A-T2289	128	91A	J-2		21EP4A
A-UT1818	128	91A	J-2	UT20A	17YP4
A-UT1858	128	91A	J-2	UT20A	17YP4
A-UT2233	128	91A	J-2	UT20A	21EP4A
A-UT2234	128	91A	J-2	UT20A	21EP4A
A-UT2266, L	128	91A	J-2	UT20A	21EP4A
A-UT2280	128	91A	J-2	UT20A	21EP4A
A-UT2281	128	91A	J-2	UT20A	21EP4A
A-UT2289	128	91A	J-2	UT20A	21EP4A
53-T1827, F, HM	128	91	J-2		17YP4
53-T1853, L	128	91	J-2		17YP4
53-T2228	128	91	J-2		21EP4A
53-T2266, L	128	91	J-2		21EP4A
53-T2269	128	91	J-2		21EP4A
53-T2270	128	91	J-2		21EP4A
53-T2271	128	91	J-2		21EP4A
53-T2273C	128	91	J-2		21EP4A
53-U1827, HM	126	91	J-1	UT20	17YP4
53-U1827	128	91	J-2	UT20	17YP4
53-U1853, L	126	91	J-1	UT20	17YP4
53-U2266, L	126	91	J-1	UT20	21EP4A
53-U2266	128	91	J-2	UT20	21EP4A
53-U2269	126	91	J-1	UT20	21EP4A
53-U2271	126	91	J-1	UT20	21EP4A
53-U2271	128	91	J-2	UT20	21EP4A

The above Philco television receivers are electrically similar to the models covered in Photofact Folder 10, Set 185, and Production Change Bulletin 66, Set 203-1.

A list of the differences is given on the next page.

(Cont. on the reverse side)

PHILCO MODELS A-T1818, A-T1858, A-T2233, A-T2234, A-T2266, L, A-T2271HM, A-T2274S, A-T2277S, A-T2280, A-T2288HMS, S, A-T2289, A-UT1818, A-UT1858, A-UT2233, A-UT2234, A-UT2266, L, A-UT2280, A-UT2289 (Code 128) (Ch. 91A, J-2), 53-T1827, F, HM, 53-T1853, L, 53-T2228, 53-T2266, L, 53-T2269, 53-T2270, 53-T2271, 53-T2273, C (Code 128) (Ch. 91, J-2). 53-U1827, HM (Code 126) (Ch. 91, J-1), 53-U1827 (Code 128) (Ch. 91, J-2), 53-U1853, L, 53-U2266, L (Code 126) (Ch. 91, J-1), 53-U2266 (Code 128) (Ch. 91, J-2), 53-U2269, 53-U2271 (Code 126) (Ch. 91, J-1), 53-U2271 (Code 128) (Ch. 91, J-2).

PRODUCTION CHANGES
BULLETIN 82

PRODUCTION CHANGES
BULLETIN 82

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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Models 53-U1827, HM, 53-U1853, L, 53-U2266, L, 53-U2269 and 53-U2271 (Code 126) are identical to the models covered, except, a built-in UHF tuner (UT20) is included in the set. A schematic of this tuner is given on the next page.

The remaining models (code 128) are identical to the models covered except, the J-2 deflection chassis is used. The UHF versions of these models also use the UT20A UHF tuner. A schematic of this tuner is given on the next page.

Chassis J-2

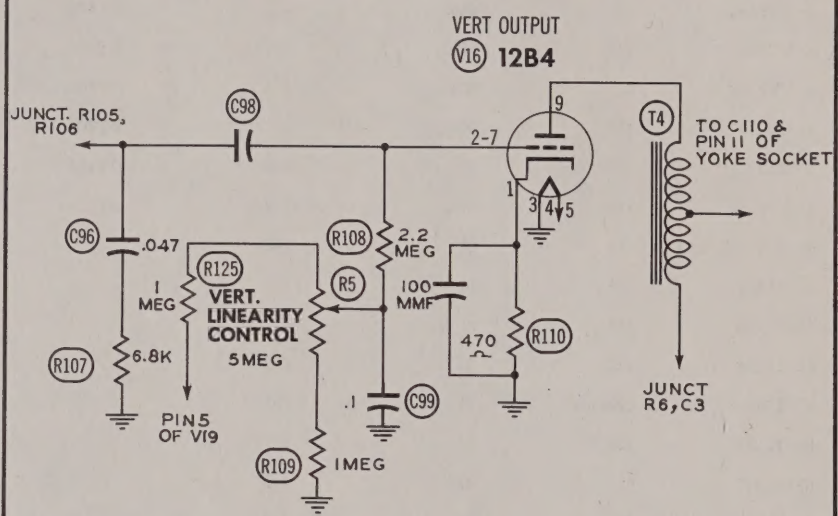
Deflection chassis J-2 is similar to chassis J-1. The differences between the two chassis are given below.

VERTICAL OUTPUT TUBE CHANGED

The vertical output tube (V16) was changed from a type 12BH7 to a 12B4. When this change was made the following changes were made in the associated circuits.

1. C96, peaking capacitor, was changed from .068MFD to .047MFD.
2. R107, peaking resistor, was changed from 5600Ω to 6800Ω.
3. C98, coupling capacitor, was changed from .1MFD to .22MFD.
4. R108, grid resistor, was changed from 1Meg to 2.2Meg.
5. R111, R112 and C100 were omitted.
6. R110, cathode resistor, was changed from 47Ω to 470Ω and a 100MMF, bypass capacitor was added across it.

A partial schematic, showing the revised vertical output circuit, is given below.

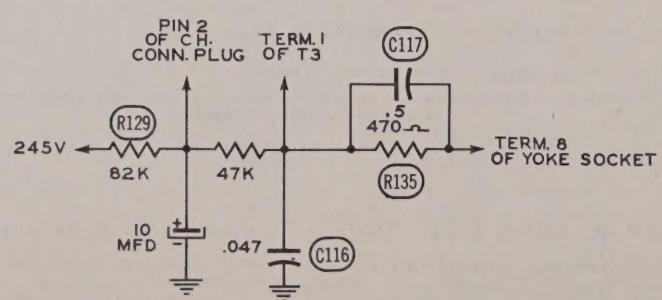


HORIZONTAL OUTPUT CIRCUIT

The following changes were made in components in the horizontal output circuit.

1. R126 was changed from 470KΩ to 1Meg.
2. R127 was changed from 3900Ω to 4200Ω.
3. A 47KΩ resistor was added between terminal 1 of the horizontal output transformer and R129.
4. A 10MFD capacitor was added from the junction of the 47KΩ resistor and R129.
5. R128 is omitted and R129 is connected directly to 245 volts.
6. R134, high voltage rectifier filament dropping resistor, was changed from 2.7Ω to 4.7Ω.

A partial schematic showing the revised circuit is given below.



(Continued on the next page)

PROPERTY OF
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PHILCO MODELS A-T1818, A-T1858, A-T2233, A-T2234, A-T2266, L, A-T2271HM, A-T2274S, A-T2278, A-T2280, A-T2281, A-T2288HMS, S, A-T2289, A-UT1818, A-UT1858, A-UT2233, A-UT2234, A-UT2266, L, A-UT2280, A-UT2281, A-UT2289(Code 128)(Ch. 91A, J-2), 53-T1827, F, HM, 53-T1853, L, 53-T2228, 53-T2266, L, 53-T2269, 53-T2270, 53-T2271, 53-T2273, C(Code 128)(Ch. 91, J-2), 53-U1827, HM(Code 126)(Ch. 91, J-1), 53-U1827(Code 128)(Ch. 91, J-2), 53-U1853, L, 53-U2266, L(Code 126)(Ch. 91, J-1), 53-U2266 (Code 128)(Ch. 91, J-2), 53-U2269, 53-U2271(Code 126)(Ch. 91, J-1), 53-U2271(Code 128)(Ch. 91, J-2).

PHILCO UHF TUNER MODEL UT20, UT20A

PHOTOFACT* Folder

AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)

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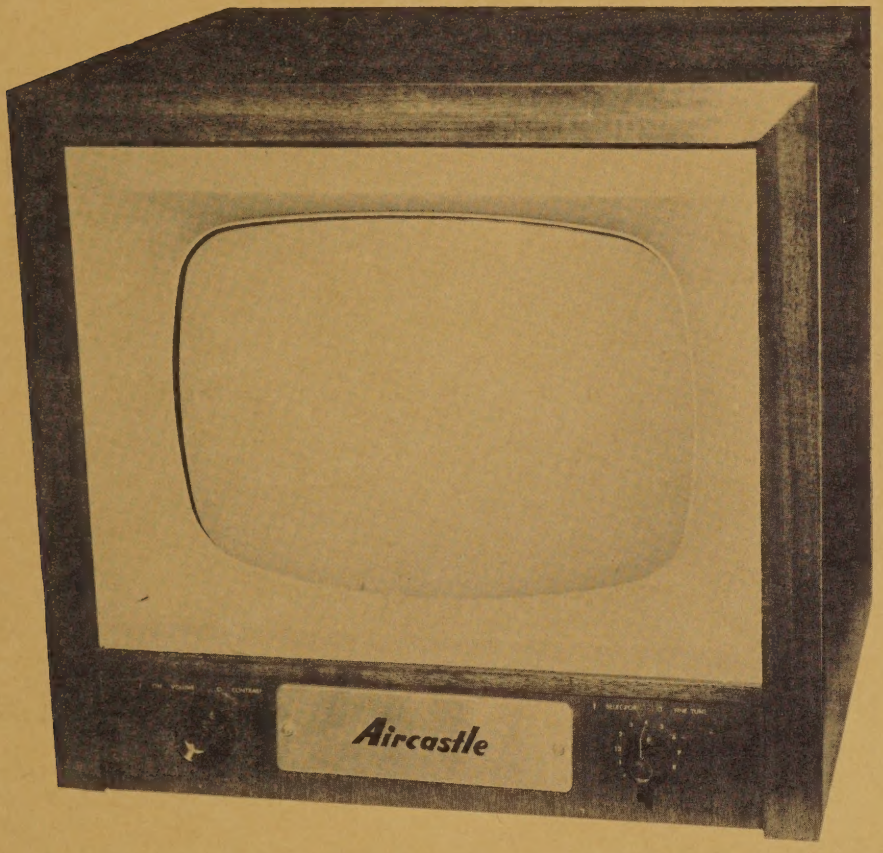
AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)



MODEL 472.17XUT.7

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DATE 12–53 SET 223 FOLDER 2

PHOTOFACT* Folder
*TRADE MARK

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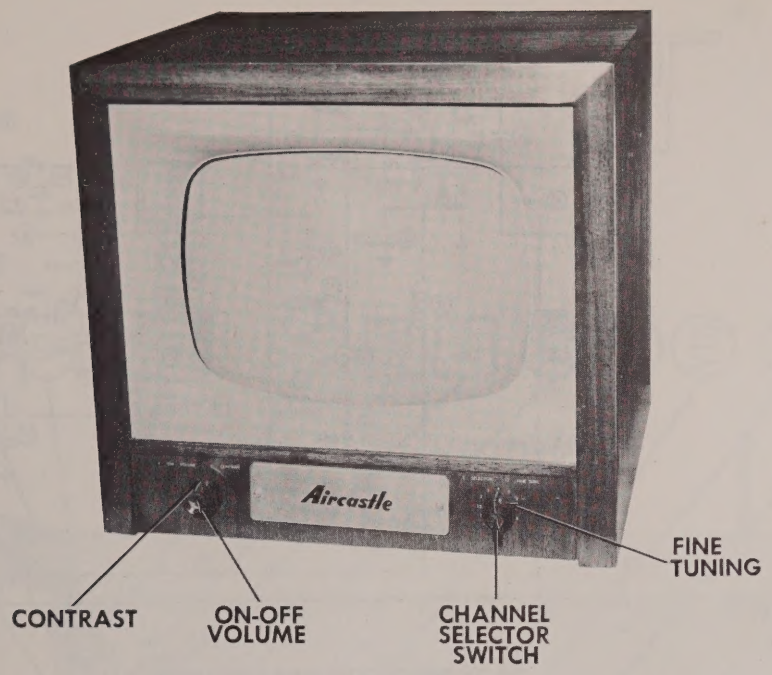
AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)



AIRCASTLE MODEL 472.17XUT.7

TRADE NAME	Aircastle	MODELS	CHASSIS	CABINET
		472.17XUCM, 472.17XUCM.1	317-B	Standard
		472.17XUCM.2, 472.17XUCM.3, 472.17XUCM.4, 472.17XUCM.5	317-D	"
		472.17XUC0, 472.17XUC0.1		
		472.17XUT.4, 472.17XUT.5	317-B	"
		472.17XUT.6, 472.17XUT.7, 472.17XUT.8	317-D	"
		472.21XUT, 472.21XUT.1	321-B	"
		472.21XUT.2	321-D	"
		472.21XUCM, 472.21XUC0	321-B	"
		472.21XUC0.1, 472.21XUC0.2	321-D	"
		472.217C, 472.217C.1, 472.217T, 472.217T.1	317-D	Deluxe
		472.221XC, 472.221XT, 472.221XT.1	321-D	Deluxe

SUPPLIER	Spiegel Inc., 1061 W. 35th. St., Chicago 9, Ill.
TYPE SET	Television Receiver
TUBES	Twenty
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.76 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 25.75MC, Sound IF 21.25MC (Intercarrier)

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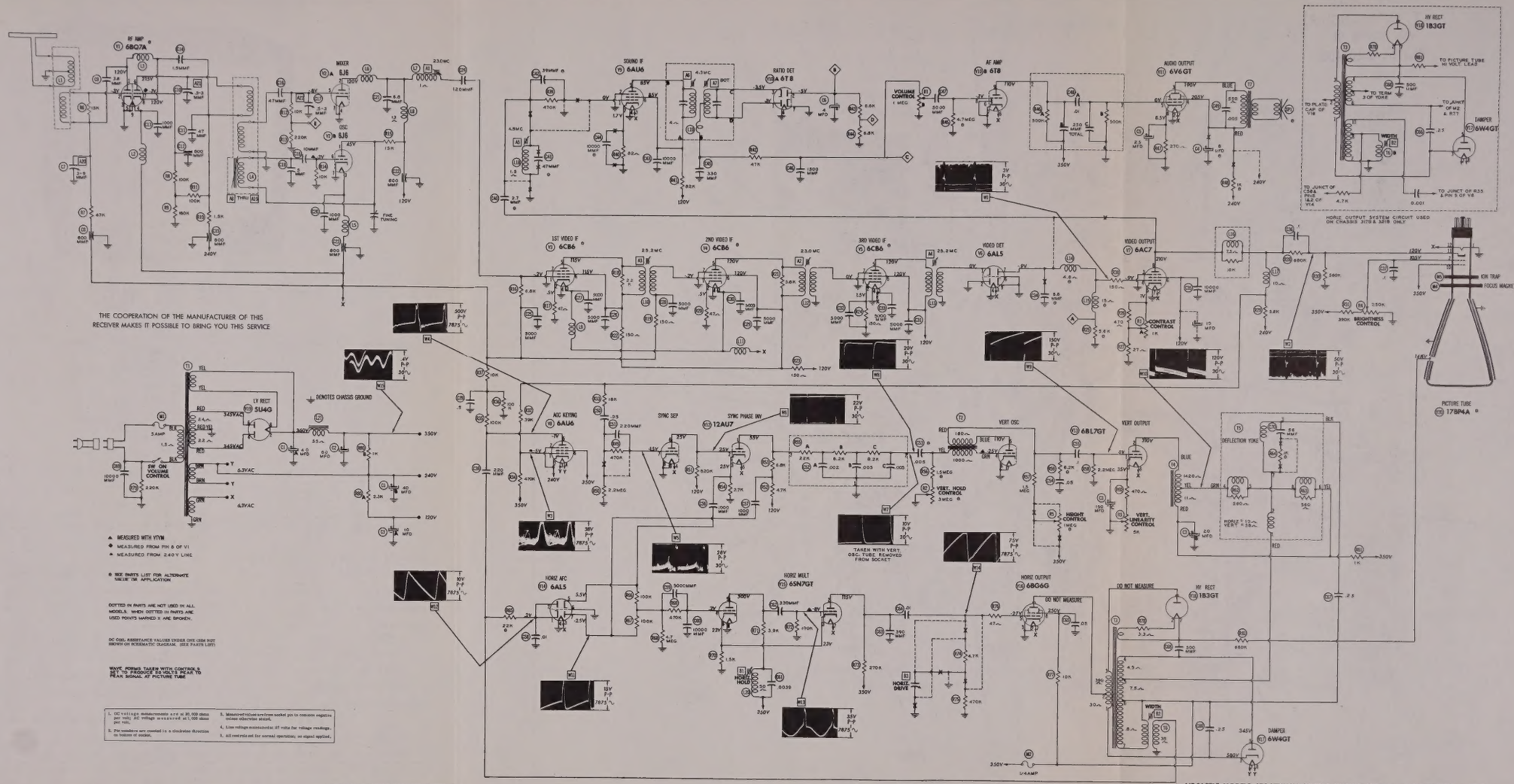
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
RF AMP 6BQ7A
MIXER 6J6
OSC 6J6
SOUND IF 6AU6
RATIO DET 6T8
AF AMP 6T8
AUDIO OUTPUT 6V6GT
HV RECT 1B3GT
1ST VIDEO IF 6CB6
2ND VIDEO IF 6CB6
3RD VIDEO IF 6CB6
VIDEO DET 6AL5
VIDEO OUTPUT 6AC7
PICTURE TUBE 17BP4A
LV RECT 5U4G
AGC KEYING 6AU6
SYNC SEP
SYNC PHASE INV 12AU7
VERT OSC
VERT OUTPUT 6BL7GT
HORIZ AFC 6AL5
HORIZ MULT 6SN7GT
HORIZ OUTPUT 6BG6G
DAMPER 6W4GT
DENOTES CHASSIS GROUND
SW ON VOLUME CONTROL
CONTRAST CONTROL
BRIGHTNESS CONTROL
HEIGHT CONTROL
VERT. LINEARITY CONTROL
VERT. HOLD CONTROL
HORIZ HOLD
HORIZ DRIVE
ION TRAP
FOCUS MAGNET
DEFLECTION YOKE
WIDTH
DO NOT MEASURE
TAKEN WITH VERT. OSC. TUBE REMOVED FROM SOCKET
HORIZ OUTPUT SYSTEM CIRCUIT USED ON CHASSIS 317G & 321B ONLY
▲ MEASURED WITH VTVM
● MEASURED FROM PIN 8 OF V1
♣ MEASURED FROM 240 V LINE
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED X ARE BROKEN.
DC COIL RESISTANCE VALUES UNDER OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 30 VOLTS PEAK TO PEAK SIGNAL AT PICTURE TUBE
1. DC voltage measurements are at 20,000 ohms per volt; AC voltage measured at 1,000 ohms per volt.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)

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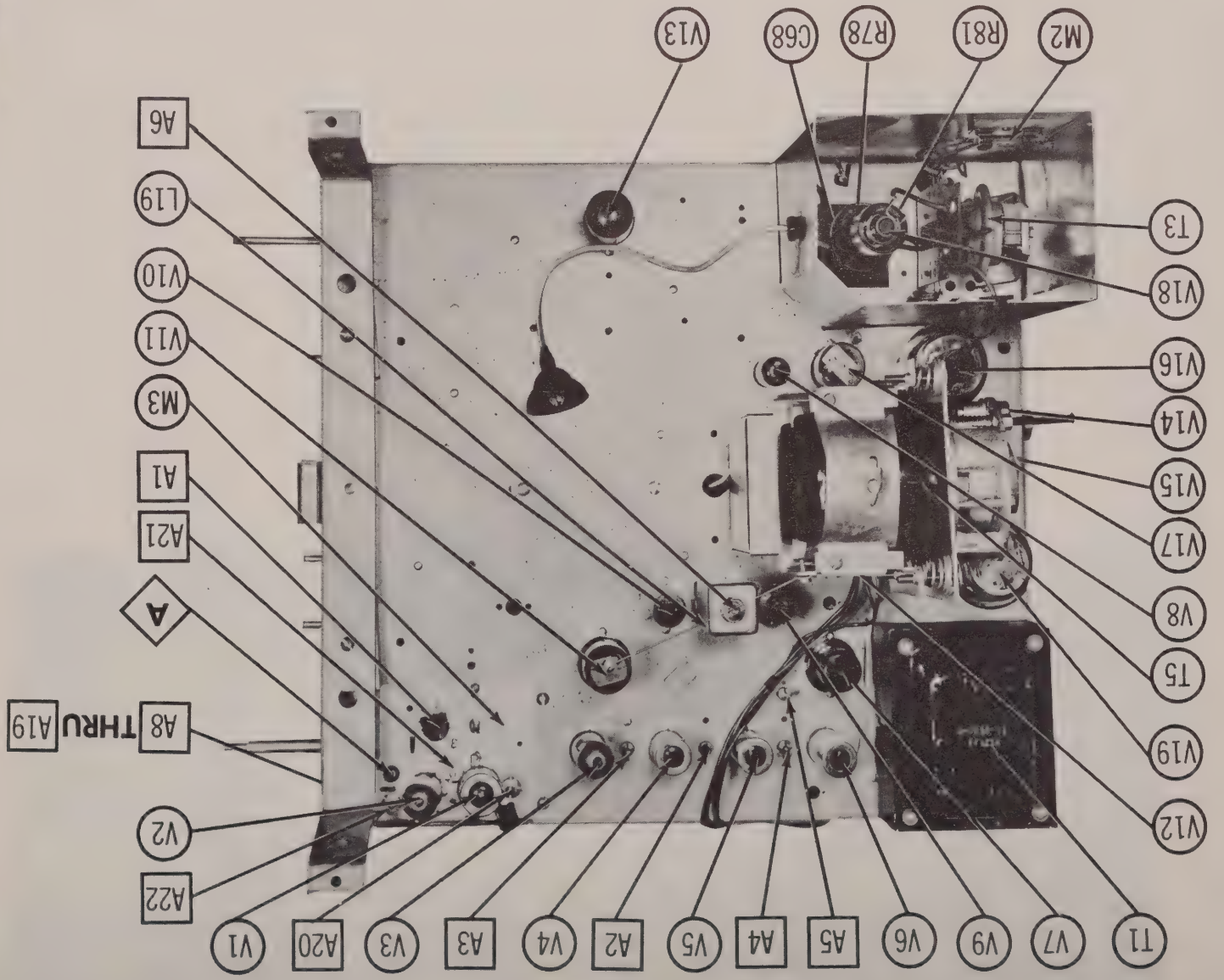
CHASSIS TOP VIEW



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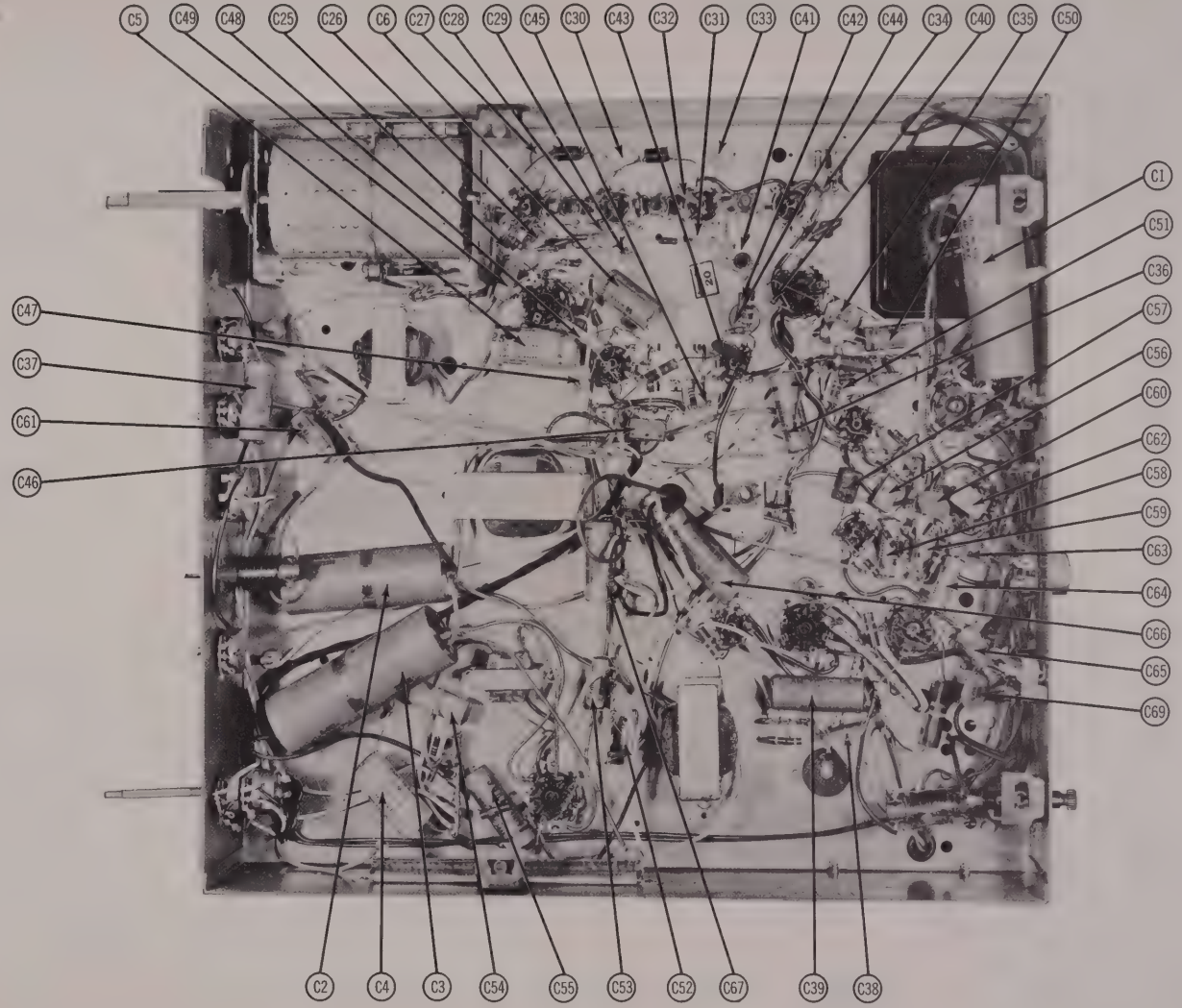

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART

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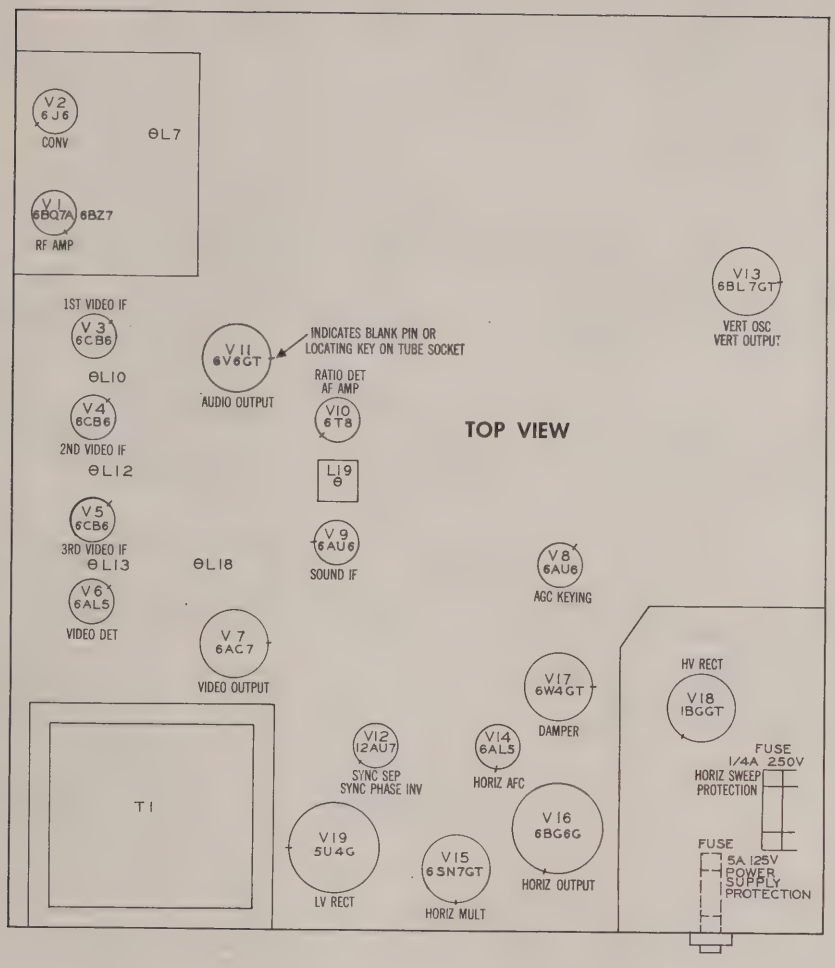


TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V19, Fuse (M1)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V7
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V7, V20
Has pic, no sound - V9, V10, V11
Overloaded picture - V8

SYNC FAILURE
No vert. sync - V12, V13
No horiz. sync - V12, V14, V15
No vert. or horiz. sync - V12

SWEEP FAILURE
No raster, has sound - V15, V.6, V17, V18, V20, Fuse (M2)
No vertical deflection - V13
Poor vert. linearity or foldover - V13
Poor horiz. linearity or foldover - V15, V16, V17
Narrow picture - V15, V16, V17, V18, V19
Vert. off freq. - V12, V13
Horiz. off freq. - V12, V14, V15

AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.2, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 which has pin 1 removed. This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the negative lead of a 1.5 volt battery to the ungrounded side of C29. Connect the positive lead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	23.0MC (Unmod)	Any	DC probe to point (A). Common to chassis.	A1, A2	Adjust for maximum deflection.
2.	"	"	25.2MC	"	"	A3, A4	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	24MC (10MC Swp)	21.25MC 22.0MC 24.3MC 25.75MC	Any	Vert. Amp. to point (A). Low side to chassis.		Check for response curve similar to Fig. 1. If necessary retouch A1 thru A4 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	.001MFD	High side to pin 4 (grid) of 6AC7 (V7). Lowside to chassis.	4.5MC Unmod	Any	DC probe to point (B). Common to chassis.	A5, A6	Adjust for maximum deflection.
5.	"	"	"	"	DC probe to point (C). Common to point (D).	A7	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.
Set the contrast control to maximum.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.001MFD	High side to Pin 4 (grid) of 6AC7 (V7). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. amp to point (B). Low side to chassis.	A5, A6	Disconnect stabilizer capacitor C6. Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
5.	"	"	"	"	"	Vert. amp to point (C). Low side to chassis.	A7	Reconnect stabilizer capacitor C6. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. Slightly retouch A6 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
The channel adjustment screws are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.
Leave 1.5 bias battery connected as under Video IF Alignment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. to point (A). Low side to chassis.	A8	Adjust to place video marker at 50% on response curve as in Fig. 4. Sound marker should be at 5% or less.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A9	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A10	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A11	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A12	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A13	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A14	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A15	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A16	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A17	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A18	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A19	

ALIGNMENT INSTRUCTIONS (cont)

PROPERTY OF
L. F. BLANKENSHIP
3928 MEADE ST.
DENVER, COLORADO

RF AND MIXER ALIGNMENT

Remove the 1.5 volt bias battery.
Connect the synchronized sweep voltage form the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205. 25MC 209. 75MC	12	Vert amp. thru 10KΩ to point (E). Low side to chassis.	A20, A21 A22	Adjust for response curve similar to Fig. 5, with markers as shown.
8.	"	"	213MC (10MC Swp)	211. 25MC 215. 75MC	13	"		Check for response similar to Fig. 5. If markers fall below 70% on any channel make compromise adjustments of A20, A21, and A22 with channel switch set to that channel, then check all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199. 25MC 203. 75MC	11			
			195MC (10MC Swp)	193. 25MC 197. 75MC	10			
			189MC (10MC Swp)	187. 25MC 191. 75MC	9			
			183MC (10MC Swp)	181. 25MC 185. 75MC	8			
			177MC (10MC Swp)	175. 25MC 179. 75MC	7			
			85MC (10MC Swp)	83. 25MC 87. 75MC	6			
			79MC (10MC Swp)	77. 25MC 81. 75MC	5			
			69MC (10MC Swp)	67. 25MC 71. 75MC	4			
			63MC (10 MC Swp)	61. 25MC 65. 75MC	3			
			57MC (10MC Swp)	55. 25MC 59. 75MC	2			

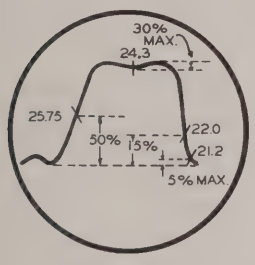


FIG. 1

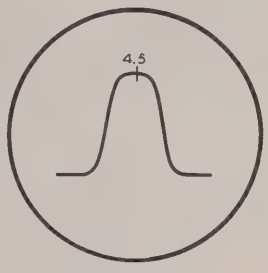


FIG. 2

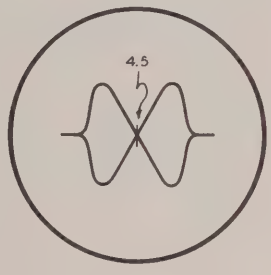


FIG. 3

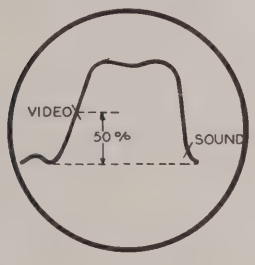


FIG. 4

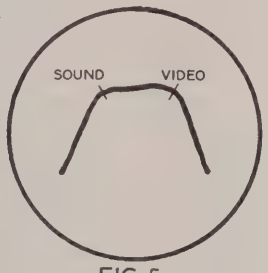
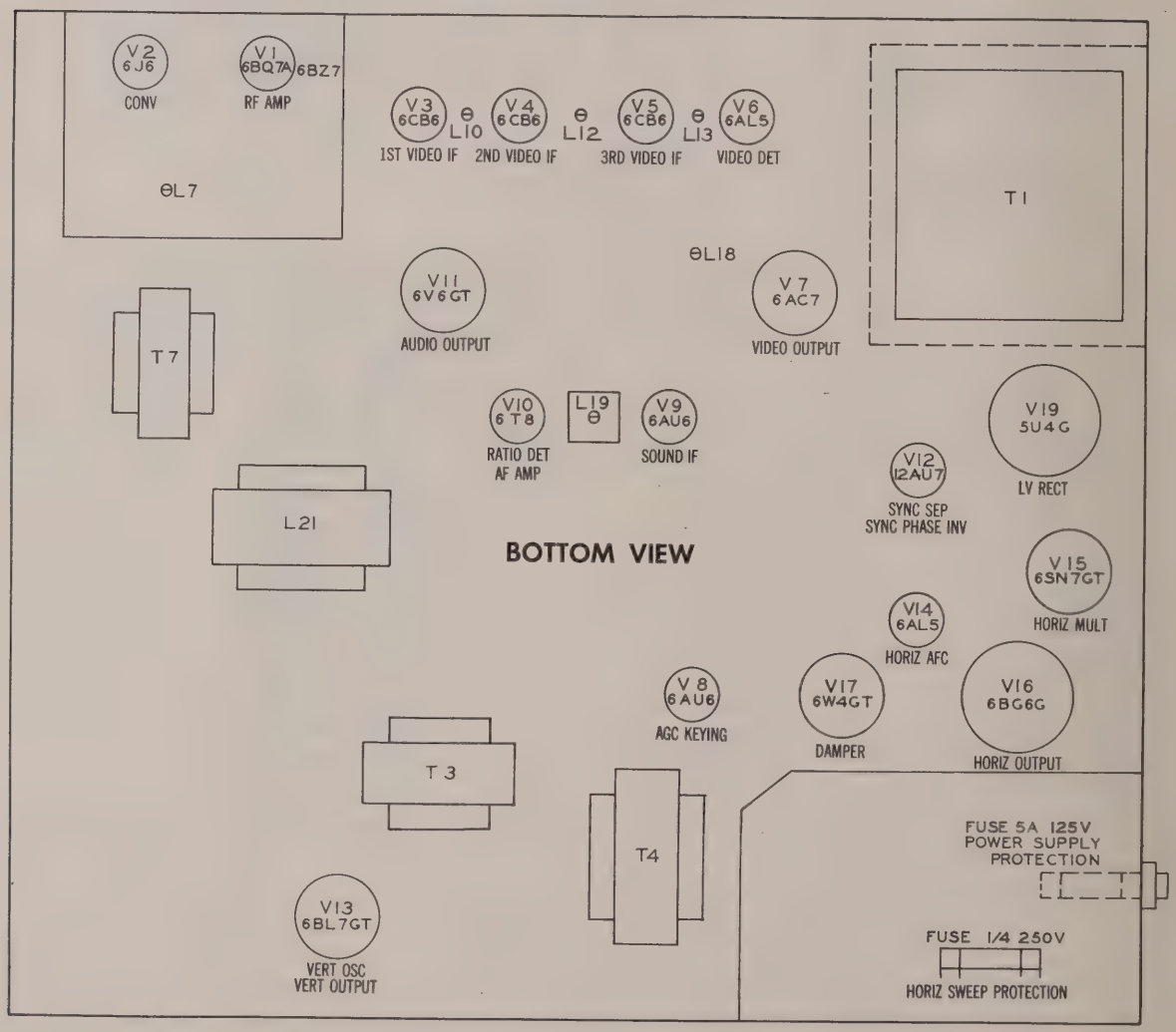


FIG. 5

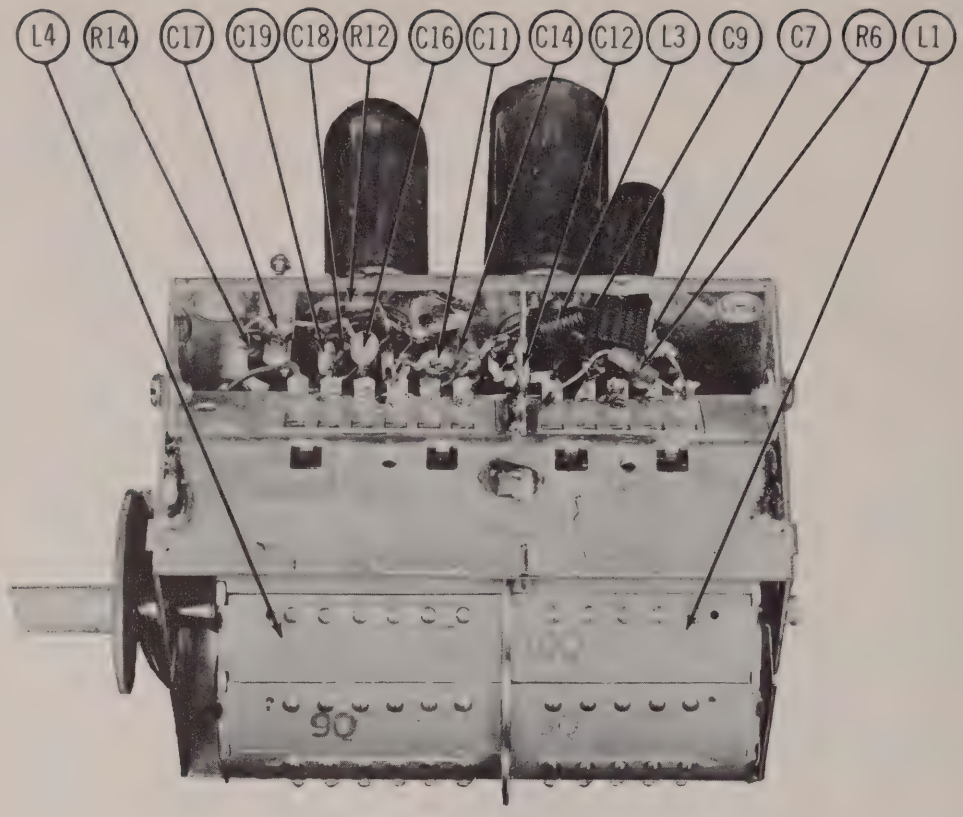
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6 BQ7A	INF	155KΩ	0Ω	.1Ω	0Ω	■2. 6KΩ	150KΩ	INF	0Ω
V 2	6J6	■18,5KΩ	■3. 5KΩ	.1Ω	0Ω	230KΩ	10KΩ	0Ω		
V 3	6CB6	117KΩ	47Ω	.1Ω	0Ω	■3. 7KΩ	■3. 7KΩ	0Ω		
V 4	6CB6	110KΩ	47Ω	.1Ω	0Ω	■3. 6KΩ	■3. 6K	0Ω		
V 5	6CB6	.3Ω	150Ω	.1Ω	0Ω	■3. 4KΩ	■3. 4KΩ	0Ω		
V 6	6AL5	.3Ω	0Ω	.1Ω	0Ω	0Ω	0Ω	5. 6KΩ		
V 7	6AC7	0Ω	.1Ω	0Ω	5. 7KΩ	120Ω	■3. 3KΩ	0Ω	■6. 7KΩ	
V 8	6AU6	■46KΩ	■1. 1KΩ	■1. 1KΩ	■1. 1KΩ	200KΩ	■55Ω	■1. 1KΩ		
V 9	6AU6	470KΩ	0Ω	.1Ω	0Ω	■85KΩ	■85KΩ	82Ω		
V 10	6T8	1. 1Meg	13. 6KΩ	1. 1Meg	0Ω	.1Ω	0Ω	0Ω	4. 7Meg	■500KΩ
V 11	6V6GT	INF	0Ω	■2. 5KΩ	■2KΩ	500KΩ	INF	.1Ω	270Ω	
V 12	12AU7	■14. 8KΩ	■820KΩ	2. 7KΩ	.1Ω	.1Ω	■820KΩ	2. 7Meg	0Ω	0Ω
V 13	6BL7GT	2. 2Meg	■2. 5KΩ	1. 4KΩ	1. 7Meg	■1. 6Meg	0Ω	0Ω	.1Ω	
V 14	6AL5	22KΩ	22KΩ	.1Ω	0Ω	4. 8Meg	0Ω	4. 8Meg		
V 15	6SN7GT	100KΩ	■270KΩ	1. 5KΩ	5. 2Meg	■4KΩ	1. 5KΩ	.1Ω	0Ω	
V 16	6BG6G	470KΩ	0Ω	0Ω	INF	475KΩ	INF	.1Ω	■10KΩ	TOP CAP ▲30Ω
V 17	6W4GT	INF	INF	INF	INF	■70Ω	■65Ω	120KΩ	120KΩ	
V 18	1B3GT	PINS 1-8 HAVE INF RESISTANCE								TOP CAP ▲420Ω
V 19	5U4G	INF	100KΩ	INF	22Ω	INF	24Ω	INF	100KΩ	
V 20	17BP4A	0Ω	■330KΩ	PIN 10 ■55Ω	PIN 11 560KΩ	PIN 12 .1Ω				

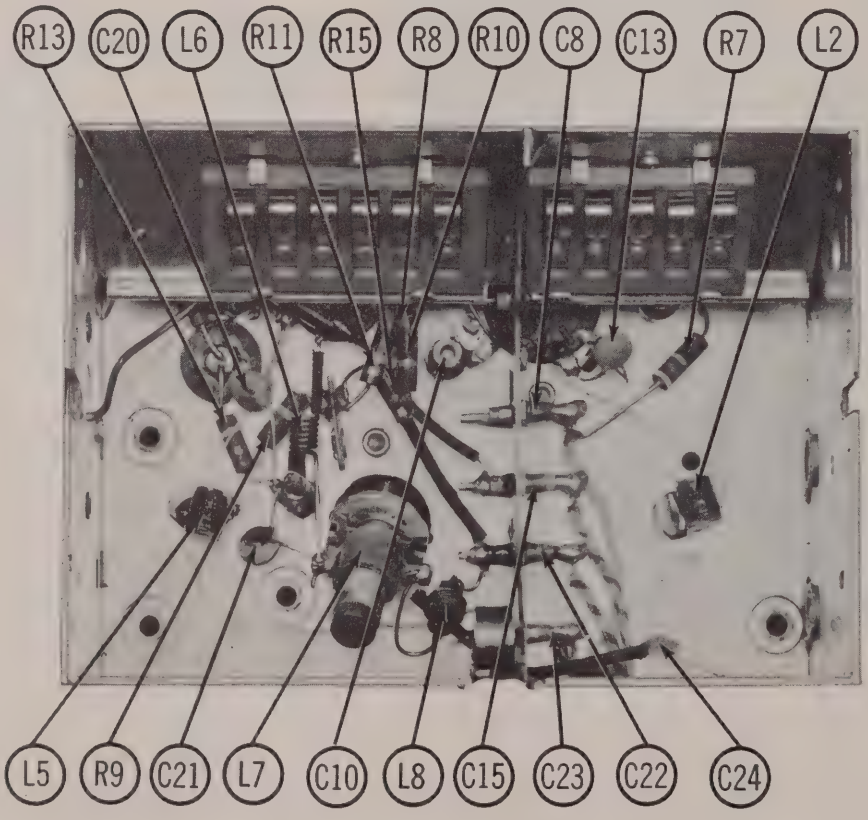
■ MEASURED FROM PIN 2 OF V19.
▲ MEASURED FROM PIN 3 OF V17.



TUBE PLACEMENT CHART

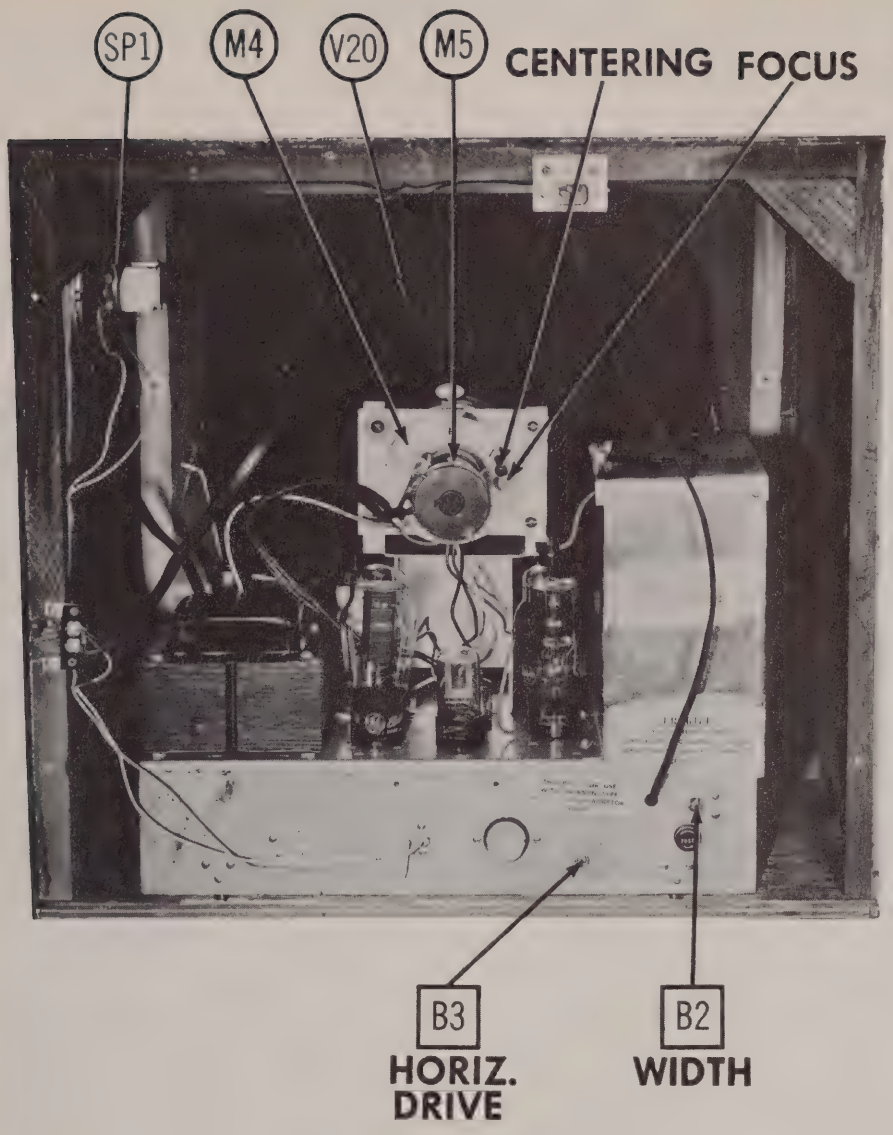


RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW

PROPERTY OF
L. F. BLANKENSHIP
3000 MEADE ST.
DENVER, COLORADO



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Adjust the horizontal hold slug (B1) until the picture synchronizes horizontally.

Turn the width control slug (B2) fully clockwise.

Adjust the horizontal drive trimmer (B3) for best compromise between maximum brightness and horizontal linearity.

Adjust B2 for a picture slightly wider than necessary to fill the picture mask horizontally.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V15, V16, V17, and V19. Check adjustments B2 and B3. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check C65, C66, C67, R77, T3, T5A and other associated circuit components.	Check C61, C62, C63, C64, R71, R72, R73, R74, L20 and other associated circuit components.

DRIVE LINES

Check adjustment of B3. Check by substitution V15, V16, and V17. Check T3, T5A and other associated circuit components.

COMPRESSED LEFT SIDE

Check by substitution V17, V16 and V15. Check T3, T5A and damper filter components.

FOLDS

Check by substitution V15, V16, and V17. Check associated circuit components especially T3 and T5A.

XMAS TREE EFFECT

Substitute V15. Check C61, C62, C63, and L20.

VERTICAL

LOSS OF SWEEP

Substitute V13. Check waveform W9.

If Satisfactory	If Unsatisfactory
Check T4, T5B, R61, R60, R3 and other associated components.	Check T2, C54, C55, R57, R58, R5 and other associated circuit components.

INSUFFICIENT SWEEP

Check adjustment of height and vertical linearity controls. Check by substitution V13. Follow procedure outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Substitute V13. Check C54, C55, R58, R59 and other associated circuit components.

COMPRESSED AT TOP

Substitute V13. Check R60, C3C, T4, T5B and other associated components.

FOLDS

Substitute V13. Check associated circuit components.

SYNC

LOSS OF HORIZONTAL AND VERTICAL SYNC

Substitute V12. Check signal at W5 for overload and/or sync clipping.

If Satisfactory	If Unsatisfactory
Check components associated with V12.	Substitute V6, V7, and V8. Check components associated with these stages.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Substitute V14 and V15. Check waveform W11.

If Satisfactory	If Unsatisfactory
Check components associated with V13 especially C59, C60, C61, C62, L20, R68, R69, R70, R71 and R72.	Check components that are associated with V12 and V14 especially R66, R67, C56 and C57.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Check by substitution V12 and V13. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T2 and other components associated with V13.	Check vertical integrator network.

HORIZONTAL BENDING OR S-ING

Substitute V15 and V16. Check horizontal AFC filter network for component failure or change of value.

VERTICAL JITTER

Substitute V12 and V13. Check associated circuit components especially C53, R56 and R2.

VIDEO

LOSS OF VIDEO

Substitute V7. Check picture tube and components associated with V7 and picture tube.

SOUND BARS (4. 5MC BEAT)

Check adjustment of local oscillator in RF tuner. Check sound take-off adjustment, A5. Check video IF alignment.

NEGATIVE PIX

Check by substitution V7, V8, and V6. Check AGC network for proper operation. Check picture tube and other associated components. Check video IF tubes and alignment.

POOR CONTRAST

Check by substitution V6 and V7. Check components associated with these stages for change of value or failure. Check picture tube and associated circuit components. Check video IF tubes and alignment.

SMEAR

Substitute V6 and V7. Check L16 and L17. Check C35 and C36. Check R26, R27, R28 and R29 for change of value. Check picture tube and other associated circuit components.

WIDE BLACK BAR ACROSS PIX

Check V1, V2, V3, V4, V5, V6 and V7 for heater to cathode leakage.

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
3014 MONROE ST.
DENVER, COLORADO

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No	USE	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1A	RF Amplifier	6BQ7A	6BQ7A	9AJ	*Not directly interchangeable with 6CB6
B	RF Amplifier	6BZ7	6BZ7	9AJ	
V2	Converter	6J6	6J6	7BF	
V3A	1st. Video IF Amp.	6CB6	6CB6	7CM	
B	1st. Video IF Amp.*	6AG5	6AG5	7BD	
V4A	2nd. Video IF Amp.	6CB6	6CB6	7CM	
B	2nd. Video IF Amp.*	6AG5	6AG5	7BD	
V5A	3rd. Video IF Amp.	6CB6	6CB6	7CM	
B	3rd. Video IF Amp.*	6AG5	6AG5	7BD	
V6	Video Detector	6AL5	6AL5	6BT	
V7	Video Output	6AC7	6AC7	8N	
V8	AGC Keying	6AU6	6AU6	7BK	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Detector - AF Amplifier	6T8	6T8	9E	
V11	Audio Output	6V6GT	6V6GT	7S	
V12	Sync Separator-Sync Clipper	12AU7	12AU7	8A	
V13	Vert. Oscillator-Vert. Output	6BL7GT	6BL7GT	8BD	
V14	Horiz. AFC	6AL5	6AL5	6BT	
V15	Horiz. Mult.	6SN7GT	6SN7GT	8BD	
V16	Horiz. Output	6BG6G	6BG6G	5BT	
V17	Damper	5W4GT	5W4GT	4CG	
V18	HV Rectifier	1B3GT	1B3GT	5Q	
V19	LV Rectifier	5U4G	5U4G	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: AIRCASTLE PART No	SYLVANIA PART No	GENERAL ELECTRIC PART No	RTMA BASE TYPE	NOTES
V20A	17BP4A	17BP4A		12D	① Circuit changes necessary.
		17BP4①	17BP4B	12D	
		17BP4①		12C	
		17BP4①		12C	
B	21EP4A	21EP4A		12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	AIRCASTLE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	40	450	CED4445	PRS450/40-40		BC45			2N537	TVA-2740	Red
B	20	450									Red
C2	80	450	CES8045	PRS450/80		BR8045A		ST845		TVA-1718	
C3A	10	450	CET2C45	PRS450/20-20		C15		4N723		TVL-3817	Blue
B	20	450									Red
C	150	50		PRS50/100							Green
C4	8	450		PRS450/8		BR845A		TC71		TVA-1704	Note 1
C5	25	25	CES2003	PRS25/35		BR252A		TC26		TVA-1205	
C6	4	50	CES8045	PRS150/4		BR415		TC30		TVA-1303	
C7	3-9		CVC050908T		929-10				503C-D1		
C8	800		CBZ05802Y	EF-001	MFT-1000						
C9	3.6		CDC05039C								
C10	.5-3		CVC0309T		929-3				CT565A		
C11	47		CDP05470K	BPD-000047	D5-470		GP1K-470		UC-5447	5GA-Q47	
C12	800		CBZ05802Y	EF-001	MFT-1000					503C-D1	
C13	1000		CDZ05102Y	BPD-001	DD-102	TM5D1	901-001		DC-521	5HK-D1	
C14	1.5		CDC05015C	SEL.5NP0	TCZ-1.5		NP0K-1R5		ZT-5515	5TCCB-V15	
C15	800		CBZ05802Y	EF-001	MFT-1000					503C-D1	
C16	47		CDP05470K	BPD-000047	D5-470		GP1K-470		UC-5447	5GA-Q47	
C17	.5-3		CVC0309T		929-3				CT565A		
C18	10		CDC05100K	SEL5NP0	TCZ-10		NP0K-100		ZT-541	5TCC-Q1	
C19	5		CDU05050D	SIN750	TCN-5		N750K-050			5TCUD-V5	
C20	1000		CDZ05102Y	BPD-001	DD-102	TM5D1	801-001		DC-521	5HK-D1	
C21	6.8		CDC05068C	SEL.5NP0	TCZ-6.8		NP0K-6R8		ZT-5568	5TCCB-V68	
C22	800		CBZ05802Y	EF-001	MFT-1000					503C-D1	
C23	800		CBZ05802Y	EF-001	MFT-1000					503C-D1	
C24	120		CCU05121K	BPD-00012	D5-121	TM5T12	GP2K-121		UC-5312	5GA-T12	
C25	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C26	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C27	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C28	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C29	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C30	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C31	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C32	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C33	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C34	6.8			SIN.5NP0	TCZ-6.8		N750K-6R8		ZT-5568	5TCCB-V68	Note 1
C35	10000		CDZ05103Y	BPD-01	DD-1032	TM5E1	81L-01		DC-511	5HK-S1	
C36	.1	400	CPZ04104M	P488-1	DF-104	PTE4P1			PT401	4TM-P1	
C37	.1	400	CPZ04104M	P488-1	DF-104	PTE4P1			PT401	4TM-P1	
C38	2.0	500		1468-00025	D6-221	5W5T25	GP2K-221			1FM-325	Note 2
C39	.5	200	CPZ02504M	P288-5		P32P5			PT405	2TM-P5	Note 3
C40	2.7										Note 4
C41	47			SI47N750	TCN-47		N750K-470		NT-5447	5TCU-Q47	Note 5
C42	39			SI39	D6-390		GP1K-390		UC-5439	5GA-Q39	Note 6
C43	10000		CDZ05103Y	BPD-01	DD-1032	TM5E1	81L-01		DC-511	5HK-S1	
C44	10000		CDZ05103Y	BPD-01	DD-1032	TM5E1	81L-01		DC-511	5HK-S1	Note 1
C45	330	500	CMA05331M								
C46	1500	500	CMA05152M		D6-152		GP2L-152			1FM-215	
C47	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005		DC-525	5HK-D5	
C48A	.01		†A-1376-6F	†PA-112-3	†PC-80		†1404-01		†103C1		
B	250										
C											
C49	.005	600	CWZ06502M	P688-005	D6-502	PTE5D5	GP2-333-502		PT625	6TM-D5	
C50	.05	400	CPZ04503M	P488-05	DF-503	PTE4S5			PT415	4TM-S5	
C51	220	500	CMA03221M	1468-00025	D6-221	5W5T25	GP2K-221			1FM-325	
C52A	.002					PTE6D2			(PT622		
B	.005		†A-1375-6F	†PA-110	†PC-100	PTE6D5	†1405-01		(PT625	†101C1	
C	.005					PTE6D5			(PT625		

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	AIRCASTLE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C53	.005	600	CPZ06502M	P688-005	D6-502	PTE6D5	GP2-333-502	PT625	6TM-D5	Note 7
C54	.05	600	CPZ06503M	P688-05	DF-503	PTE6S5		PT815	6TM-S5	
C55	.1	600	CPZ06104M	P688-1	DF-104	PTE6P1		PT601	6TM-P1	
C56	1000	500	CMA05102K	1468-001	D6-102	1W5D1	GP2L-102		1FM-21	
C57	1000	500	CMA05102K	1468-001	D6-102	1W6D1	GP2L-102		1FM-21	
C58	.01	600	CPZ06103M	P688-01	D6-103	PTE6S1	GP2-333-103	PT611	6TM-S1	
C59	5000		CDZ05502Y	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C60	10000		CDZ05103Y	BPD-01	DD-1032	TM5E1	81L-01	DC-511	5HK-S1	
C61	.0039	600	CMB05392K	1464-004					MB-34	
C62	330	500	CMA05331K	1469-00035					MB-34	
C63	390	500	CMA05391K	1469-0004					MB-34	
C64	.01	600	CPZ06103M	P688-01	D6-103	PTE6S1	GP2-333-103	PT611	6TM-S1	
C65	.05	400	CPZ08503M	P488-05	DF-503	PTE4S5		PT625	4TM-S5	
C66	.25	600	CPZ06254M	P686-25		PTE6P25		PT6025	6TM-P25	
C67	.25	200	CPZ02254M	P286-25		PT2P25		PT4025	2TM-P25	
C68	500	20000	CDZ20K501	HV20C	TV3-502	MM-C20T5	413-501	HV30035A	20DK-T5	
C69	10000		CDZ05103Y	BPD-01	DD-1032	TM5E1	81L-01	DC-511	5HK-S1	
C70	56	2000	CMA20560K							

Note 1. Not used in all Models.
Note 2. Some Models use .001MFD in this application (part #CPZ06102M).
Note 3. Some Models use 1.0MFD in this application.
Note 4. Some Models use 6.8MMF in this application (part #CCC05068K).
Note 5. Not used in some Models, others use 10MMF in this application.
Note 6. Some Models use 20MMF in this application (part #CCC05200K).
Note 7. Some Models use .01MFD in this application.
† Items C48A, C48B, C48C, R46A, R46B are combined in one unit.
when replacing items separately C48B and C48C should total 250MMF.
* Items C52A, C52B, C52C, R58A, R55B, R55C are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	AIRCASTLE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A-	1000Ω	½	RVM-1005	QJ-258*	RTV-386		UF15L	Contrast - Panel
B	1Meg	½	Not Req.		Not Req.		UR16A	Volume-Rear
C	Switch		Not Req.		Not Req.		US-26	Attach to R1B
R2A	3Meg.	½	RVC-102N	QU-140	AG-85-S	AB-84	U-59	Vert. Hold-Note 1
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R2A
R3A	5000Ω	2	RVC-103N		A43-5000	YK-135	R5000U.	Vert. Linearity
B	Shaft		Not Req.		FKS-1/4	Not Req.	Not Req.	Attach to R3A
R4A	250Kr.	½	RVC-100N	QU-130	AG-55-S	AB-50	SU-46	Brightness
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R4A
R5A	1Meg	½	RVC-101N	QU-137	AG-81-S	AB-69	SU-54	Height - Note 2
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R5A

*CONCENTRIKIT EQUIVALENT-KIT K-2 BASE ELEMENTS & SHAFT Q11-108-P1-204 (PANEL)
Q11-1374 & R2-316 (REAR) & SWITCH 76-1

Note 1. Some models may use a 1Meg control in this application.
Note 2. Some models may use a 3Meg control in this application.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	AIRCASTLE PART No.	IRC PART No.	NOTES
R6	15KΩ	½		BTS-15K	
R7	47KΩ	½	RCC472M		
R8	100KΩ	½		BTS-100K	
R9	160KΩ 5%	½			
R10	1500Ω	½	RCC153M	BTS-1500	
R11	100KΩ 5%	½			
R12	10KΩ	½		BTS-10K	
R13	220KΩ	½			
R14	10KΩ	½		BTS-10K	
R15	15KΩ	½			
R16	6800Ω	½	RCC682K	BTS-6800	
R17	47Ω	½	RCC470K	BTS-47	
R18	22KΩ	½	RCC223K	BTS-22K	
R19	150Ω	½	RCC151M	BTS-150	
R20	47Ω	½	RCC470K	BTS-47	
R21	5600Ω	½	RCC562K	BTS-5600	
R22	150Ω	½	RCC151M	BTS-150	
R23	150Ω	½	RCC151M	BTS-150	
R24	150Ω	½	RCC151M	BTS-150	
R25	5600Ω	½	RCC562K	BTS-5600	Note 3
R26	470Ω	½	RCC471M	BTS-470	
R27	27Ω	½	RCC270M	BTS-27	
R28	680KΩ	½	RCC684M		
R29	1500Ω	1		BTA-5600	
R30	560KΩ	½	RCC564M	BTS-560K	
R31	390KΩ	½	RCC394M	BTS-390K	
R32	39KΩ	½		BTS-39K	
R33	18KΩ	½	RCC183M	BTS-18K	
R34	470KΩ	1	RCC474M	BTA-470K	
R35	100KΩ	½	RCC104M	BTS-100K	
R36	100KΩ	½	RCC104M	BTS-100K	
R37	10KΩ	½	RCC103M	BTS-10K	
R38	150Ω	½	RCC151M	BTS-150	
R39	470KΩ	1		BTA-470K	
R40	82Ω	½	RCC820M	BTS-82	
R41	82KΩ	1		BTA-82K	
R42	47KΩ	½	RCC473M	BTS-47K	
R43	6800Ω	½	RCC682K	BTS-6800	
R44	6800Ω	½	RCC682K	BTS-6800	
R45	4.7Meg	½	RCC475M	BTS-4.7Meg	Note 4

ITEM No.	RATING: OHMS	RATING: WATT	AIRCASTLE PART No.	IRC PART No.
R46A	500KΩ	½	†A-1376-6F	BTS-500K
B	500KΩ	½		BTS-500K
R47	270Ω	1	RCP271M	BTA-270
R48	8000Ω	1		BTA-8000
R49	470KΩ	½	RCC474M	BTS-470K
R50	2.2Meg	½	RCC225M	BTS-2.2Meg
R51	820KΩ	½	RCC824M	BTS-820K
R52	4700Ω	½	RCC472K	BTS-4700
R53	6800Ω	½	RCC682K	BTS-6800
R54	2700Ω	½	RCC272K	BTS-2700
R55A	22KΩ	½		BTS-22K
B	22KΩ	½	*A-1375-6F	BTS-8200
C	8200Ω	½		BTS-8200
R56	1.5Meg	½	RCC155M	BTS-1.5Meg
R57	1.5Meg	½	RCC155M	BTS-1.5Meg
R58	2.2Meg	½	RCC225M	BTS-2.2Meg
R59	8200Ω	½	RCC822K	BTS-8200
R60	4700Ω	½	RCC471M	BTS-470
R61	1000Ω	1	RCP102M	BTA-1000
R62	5600Ω	½	RCC561K	BTS-5600
R63	560Ω	½	RCC561K	BTS-560
R64	1000Ω	1		BTS-1000
R65	22KΩ	1		BTA-22K
R66	100KΩ	½	RCC104K	BTS-100K
R67	100KΩ	½	RCC104K	BTS-100K
R68	4.7Meg	½	RCC475M	BTS-4.7Meg
R69	470KΩ	1	RCC474M	BTA-470K
R70	1500Ω	½	RCC152K	BTS-1500
R71	3900Ω	½	RCC392K	BTS-3900
R72	100KΩ	½	RCC104K	BTS-100K
R73	270KΩ	½	RCC274K	BTS-270K
R74	4700Ω	½		BTS-4700
R75	470KΩ	1		BTA-470K
R76	47Ω	½	RCG103M	BT S-47
R77	10KΩ	2	RCG103M	BTB-10K
R78	5.3Ω	½	RCC033K	
R79	220KΩ	½	RCC224M	BTS-220K
R80A	2300Ω	9	RWT232K	
B	2000Ω	12	RW T332K	
R81	680KΩ	½	RCC684M	BTS-680K

† Items R45A, R45B, C48A, C48B, C48C, are combined in one unit.
* Items R55A, R55B, R55C, C52A, C52B, C52C are combined in one unit.
Note 1. Some Models may use a 1Meg resistor in this application.
Note 2. Some Models may use a 10KΩ resistor in this application.
Note 3. Some Models may use a 680KΩ resistor in this application.
Note 4. Used in late production models only.
Note 5. Some Models use A4700Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI	RATING: SEC 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANCOR PART No	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.	REPLACEMENT DATA: RCA TYPE NO.
T1	117VAC @ 1.75A	680VCT 230ADC	5VAC @ 3A	6.3VAC @ 1.5A (Sec. 4) 6.3VAC @ 7.4A	B-1650-13	P-8150① ②				

① Drill new mounting holes.
② Parallel the two 6.3V., 5A. winding and use as Sec. 4.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI	RATING: DC RESISTANCE SEC	AIRCASTLE PART No.	STANCOR PART No	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	180Ω	1000Ω	A-1681-13	A-8125	A-3003	TBO-5	A-97X		Vert.Osc. Trans.
T3 A	4250Ohsp @ 30Ω	12.5Ω tap @ .6Ω, 8.1Ω Sec. 2 0Ω	A-8126② B-1675-13A B-1676-13A①	③	HVO-10② ④	TPB-8② ⑤			Horiz.Output Trans.
B			C-1677-13A ⑥						
T4	1430Ω tap @ 11Ω		B-1862-13	A-8123	A-3037	TSO-8⑦	A-102X		Vert.Output Trans.
T5A	10Ω		B-1452-9	DY-8A ⑦	MDF-70	TY02 ⑦	Y-12 ⑦		Horiz.Deflection Coils
B	58Ω								Vert.Deflection Coils
T6A	.37Ω	35Ω	B-1467-10						Width Coil & AGC winding
B			A-1468-10 ⑦						Width Coil

① Alternate horizontal output transformer.
② Use original mounting bracket or drill new mounting holes.
③ Connect as in original circuit.
④ Connect as in original circuit, except, connect original terminal #6 to new terminal #8, original #7 to new #6.
⑤ Connect original terminal #1 to new terminal #1, original #4 to new #7, original #5 to new #4, original #6 to new #5, original #7 to new #6.
⑥ Connect as auto transformer.
⑦ Use original horizontal deflection coil network, if necessary.
⑧ Use original deflection coil network.
⑨ Used in Ch.317B and 321B only.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI	RATING: IMPEDANCE SEC.	RATING: DC RES PRI	RATING: DC RES SEC	REPLACEMENT DATA: AIRCASTLE PART No	REPLACEMENT DATA: STANCOR PART No	REPLACEMENT DATA: MERIT PART No	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: TRIAD PART No.	NOTES
T7	5.2KΩ	3.2Ω	550Ω	.5Ω	A-1654-13 B-1653-13①	A-3823	A-3019	R0-303	S-5X	

① Alternate output transformer.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V C	RATINGS: IMP	REPLACEMENT DATA: AIRCASTLE PART No	REPLACEMENT DATA: JENSEN PART No	REPLACEMENT DATA: QUAM PART No	NOTES
SP1A	5"	PM	3	2Ω	B-1654-13	ST-105 Mod. P5-X	5A1	① Used in 17" console models. ② Used in 21" console models. ③ 10" PM oval speaker used in model 472 17KUCM. 5
B	6"	PM	3	2Ω	B-4600-15①	ST-108 Mod. P6-X	6A1	
C	8"	PM	3	2Ω	B-4604-15②	ST-115 Mod. P8-Y	8A21	

COILS (RF-IF)

ITEM No.	USE	DC RES PRI	DC RES SEC.	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: MEISSNER PART No	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: MILLER PART No.	NOTES
L1	Ant. Coils	0@CT	0Ω					
L2	Fil. Choke	0Ω						
L3	Neutr. Coil	0Ω						
L4	RF, Mixer Grid & OSC. Coils	0Ω						
L5	Fil. Choke	0Ω						
F6	RF Choke	0Ω						
L7	1st Video IF	1Ω						
L8	RF Choke	1.3Ω						
L9	Fil. Choke	0Ω		A-1481-10	19-3001	TV-189	6175	.3Microhenry
L10	2nd Video IF	3Ω	.3Ω	B-1471-10	17-1062		6250	
L11	Fil. Choke	0Ω		A-1481-10	19-3001	TV-189	6175	.3Microhenry
L12	3rd Video IF	3Ω	.3Ω	B-1471-10	17-1063		6249	
L13	4th Video IF	3Ω	.3Ω	B-1471-10	17-1064		6250	
L14	Series Peaking Coil	4.8Ω		A-1482-10	19-3125		6153	120 Microhenries Some models use 36 Microhenries Series Peaking Coil (Part #A-1469-10).
L15	Shunt Peaking Coil	15Ω		A-1485-10	19-3860	TV-188	4650	600Microhenries Some models use 120 Microhenries Shunt Peaking Coil (Part # A-1482-10).
L16	Series Peaking Coil	7.5Ω		A-1483-10	19-3250*	TV-185*	4648*	240Microhenries wound on 18KΩ Resistor
L17	Shunt Peaking Coil	10Ω		A-1484-10	19-3500	TV-188	4648	380Microhenries
L18	Sound IF	1.5Ω		14A-1477-10	17-3400	TV-151	1469	
L19	Ratio Det.	40	2@CT	B-1472-10	17-1033	TV-110	1468	Tertiary Winding-.5Ω
L20	Horiz. Osc.	50Ω		A-1479-10	19-1575	TV-163†	6210†	

* Parallel with 18KΩ Resistor
† Enlarge Mtg. Hole

AIRCASTLE MODELS 472.17XUCM, XUCM.1, XUCM.3, XUCM.4, XUCM.5, XUCO, XUCO.1, XUT.4, XUT.5, XUT.6, XUT.8, 472.21XUCM, XUCO, XUCO.1, XUCO.2, XUT, XUT.1, XUT.2, 472.217C, C.1, T, T.1, 472.221XC, XT, XT.1 (Ch. 317-B, -D, 321-B, -D)

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	AIRCASTLE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
L21	.230A	55Ω	2.2HY	A-1651-13 B-1651-10②	C-2325	C-2974①	TR-4200①	C-23X

① Drill one new mounting hole.
② Alternate filter choke.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			AIRCASTLE PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	5A 250V	A-3751-30		312005 (5A-3AG)	342001	MTH5	HKP
M2	3AG	1/4A 250V	A-3750-30		312.250 (1/4A-3AG)	357001	AGC1/4	4405

MISCELLANEOUS

ITEM No.	PART NAME	AIRCASTLE PART No.	NOTES
M3	RF Tuner	A-4112-33	Cascode, Standard Coil
M4	Focus Magnet	B-4101-33	Includes Centering Assembly
M5	Ion Trap	A-4102-33	
B4	Trimmer Cap	CVM501ST	Horiz. Drive 50-500MMF
	Knob	A-1054-4	Channel Selector-all standard models
	Knob	A-1055-4	Fine Tuning-all standard models
	Knob	A-1056-4	Off-On Volume-all standard models
	Knob	A-1057-4	Contrast-all standard models
	Safety Glass	B-4623-25	17" standard models
	Safety Glass	B-4624-25	21" standard models
	Mask	B-4870-1	17" standard models
	Mask	B-4872-1	21" standard models
	Knob	A-1050-4	Channel Selector-all deluxe models
	Knob	A-1051-4	Fine Tuning-all deluxe models
	Knob	A-1052-4	Off-On Volume-all deluxe models
	Knob	A-1053-4	Contrast-all deluxe models
	Safety Glass	B-4611-25	17" deluxe models
	Safety Glass	B-4612-25	21" deluxe models
	Mask	B-4359-35	17" deluxe models
	Mask	B-4361-35	21" deluxe models
	Back Cover	C-1702-19	All 17" Models
	Back Cover	C-1705-19	All 21" Models

TROUBLE SHOOTING AIDS (cont)

PROPERTY OF
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DENVER, COLORADO

AUDIO

WEAK OR NO SOUND

Check by substitution V9, V10, and V11. Check stages of V10B and V11 using audio signal generator.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and circuit components.	Check components associated with V10B and V11.

BUZZ

Check adjustment of local oscillator. Adjust A7 for mimimum buzz. If buzz is still objectionable substitute V10 and readjust A6 and A7. Check components associated with V10A.

DISTORTED OR GARBLED

Check by substitution V9, V10, and V11. Check stages of V10B and V11 using an audio signal generator and scope. Apply audio signal across R45. Connect scope across primary of T7.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components that are associated with V10B and V11.

POWER

DEAD SET

Check fuse M1, AC interlock assembly, switch on volume control and T1.

SMALL AND/OR DIM PIX

Substitute V19. Check B+ filter and decoupling network components.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check fuse M2. Check by substitution V15, V16, V17 and V18. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check R78, R81, C68, T3, T5A, C65, R77 and other components.	Check C62, C63, C64, R70, R71, R72, R73, R74, R75 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V15, V16, V17, V18 and V19. Check picture tube. Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V18, V19, V17, V16 and V15. Check R78, R81, C68, T3, T5A, C65, R77, picture tube and other associated components.

GENERAL

RASTER SOUND NO PIX

See "Loss of Video".

RASTER NO SOUND NO PIX

Check by substitution V1, V2, V3, V4, V5, V6 and V7. Check associated circuit components.

NO RASTER NO SOUND

See "Dead Set".

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs (behind metal plug). The adjustments are accessible, one at a time, through the small hole in the cabinet to the right of the channel selector shaft.

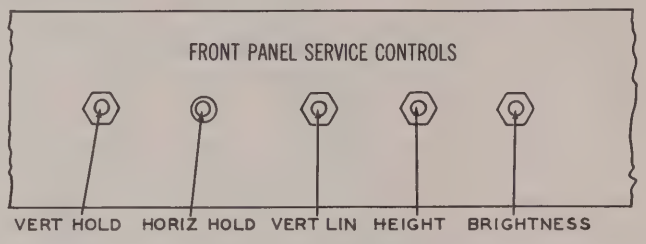
PICTURE TUBE SAFETY GLASS CLEANING

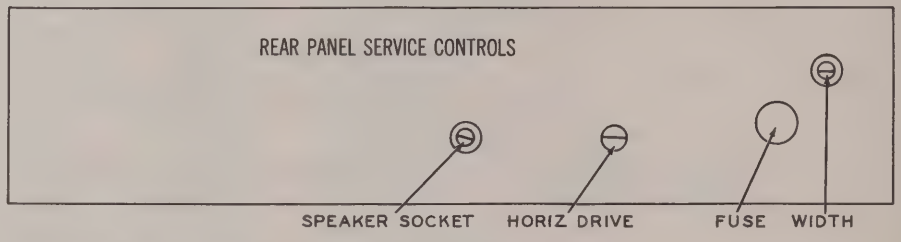
For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION





HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjust the horizontal horizontal hold slug (L20) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L19) located on bottom of chassis. (See tube placement chart).

FUSES

Two fuses are used. One for horizontal sweep circuit protection and one LV power supply protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 4 push on type control knobs from front panel.
2. Remove 6 wood screws. Remove rear cover.
3. Disconnect built-in antenna and speaker.
4. Remove 2 wood screws. Remove antenna bracket.
5. Remove 2 wood screws. Remove AC input plate.
6. Remove 5 chassis bolts. Remove chassis.
7. Remove 2 speaker nuts. Remove speaker.

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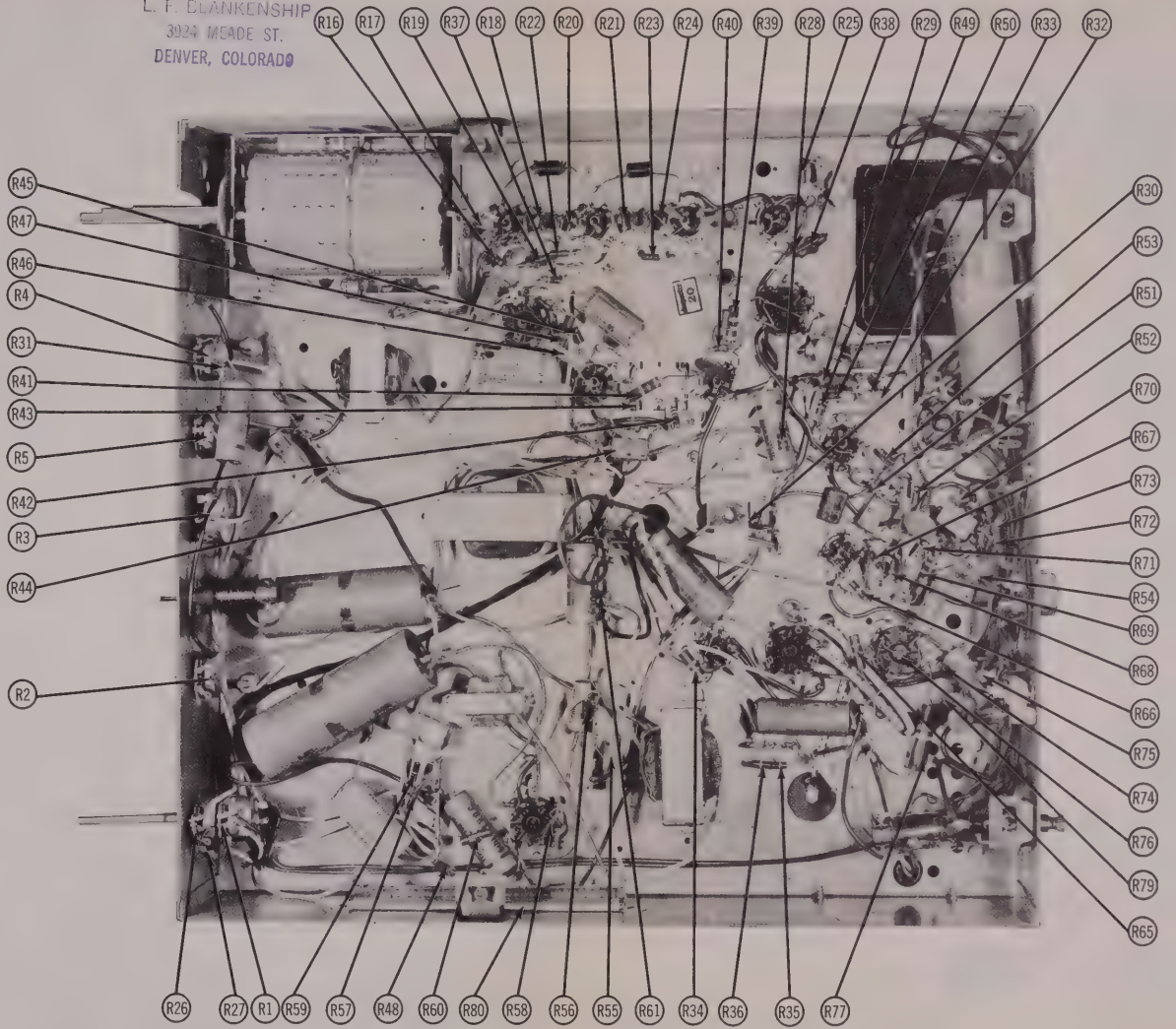
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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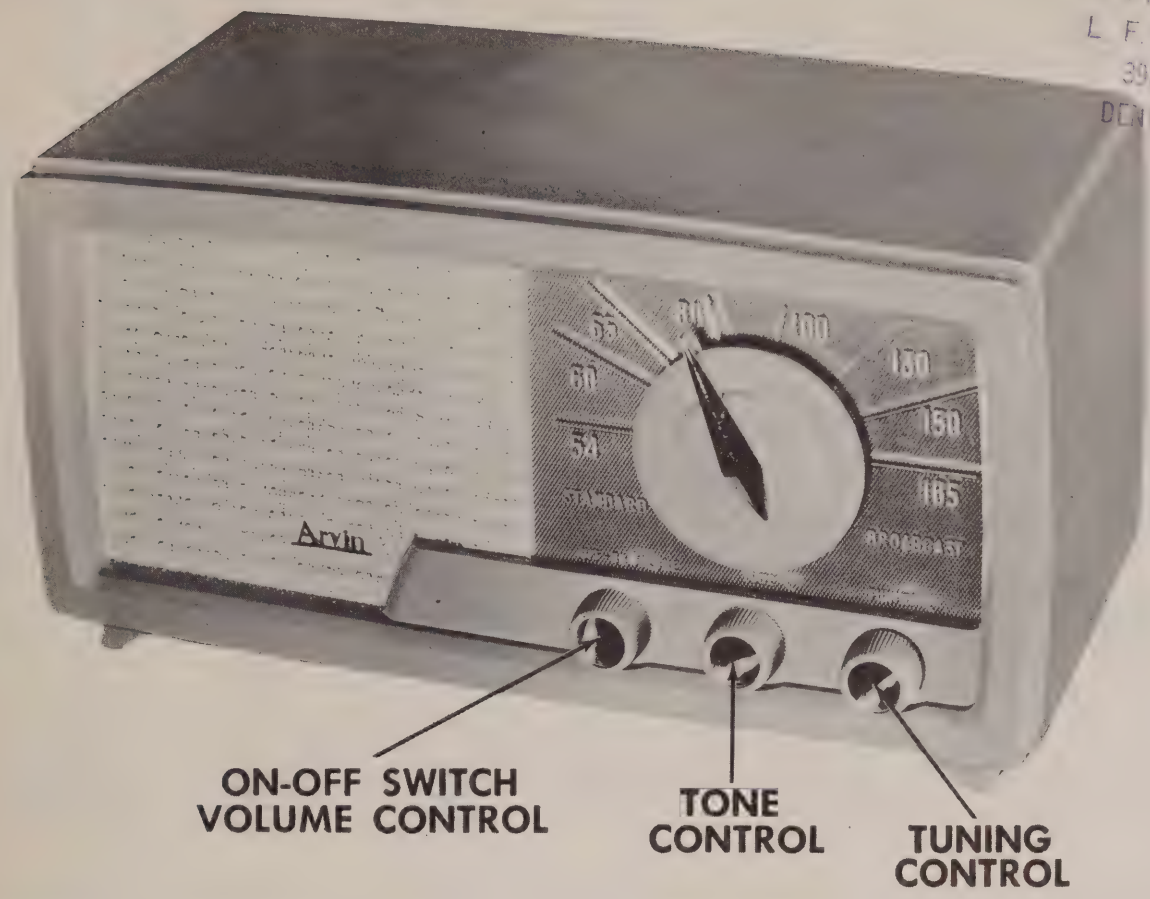
3924 [illegible] ST.
DENVER, COLORADO

ARVIN
MODEL 760T (Ch. RE342)



ARVIN
MODEL 760T (Ch. RE342)

TRADE NAME	Arvin Model 760T (Ch. RE342)
MANUFACTURER	Arvin Industries, Columbus, Indiana
TYPE SET	AC/DC Operated AM Superheterodyne Receiver
TUBES (Six)	Types 12SK7 RF Amp., 12SA7 Conv., 12SK7 IF Amp., 12SQ7 Det.-AVC-AF Amp., 35L6GT Audio Output, 35Z5GT Rectifier
POWER SUPPLY	105-125 Volts AC/DC RATING .26 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540-1650KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial. Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 8 (grid) of 12SA7 (V2). Low side to B-.	455KC (400% Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1650KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal	"	A6, A7	"
4.		"	600KC	Tune to 600KC signal	"		Bend slotted plates on plates on antenna and RF rotor plate of tuning gang for maximum deflection.
5.	Check coverage (540-1650KC) and calibration at 540, 600, 1000 and 1400KC. If necessary repeat steps 2, 3 and 4.						

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

ARVIN MODEL 760T

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: ARVIN PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	RF Amplifier	12SK7	12SK7	8N	
V2	Converter	12SA7	12SA7	8R	
V3	IF Amplifier	12SK7	12SK7	8N	
V4	Det-AVC-AF Amp.	12SQ7	12SQ7	8Q	
V5	Audio Output	35L6GT	35L6GT	7S	
V6	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ARVIN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	80	150	A24249	PRS150/80-40		BBRD8415		TCD498	TVA-2460	Red
B	50	150						PT415	2TM-S5	Blue
C2	.05	200	C20067-503	P288-05	DF-503	PTE4S5				
C3	50	500	C20065-500	1469-00005	D6-500	5W5Q5	GP1K-500	MC-225	MS-45	
C4	220		C20203-221	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C5	.001	200	C20067-102	P688-001	D6-102	PTE6D2	GP2L-102	PT621	6TM-D1	
C6	.01	200	C20068-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C7	220		C20203-221	SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C8	.01	400	C20068-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C9	.003	600	C20069-302	P688-003	D6-302	PTE6D3	GP2-333-302	PT623	6TM-D3	
C10	.01	400	C20068-103	P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C11	.05	400	C20068-503	489ZX-05		PTE4S5		PT415	4TM-S5	
C12	.05	400	C20068-503	489ZX-05		PTE4S5		PT415	4TM-S5	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ARVIN PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	C25699	Q13-133X	At-78	BTSK-67-S	UT-430	Volume -Tapped@150KΩ
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SW-A	Not Req.	US-26	Attach to R1A
R2A	500KΩ	½	C25700	Q13-133	AG-60-Z	BSK-60	U-48	Tone
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R2A

RESISTORS

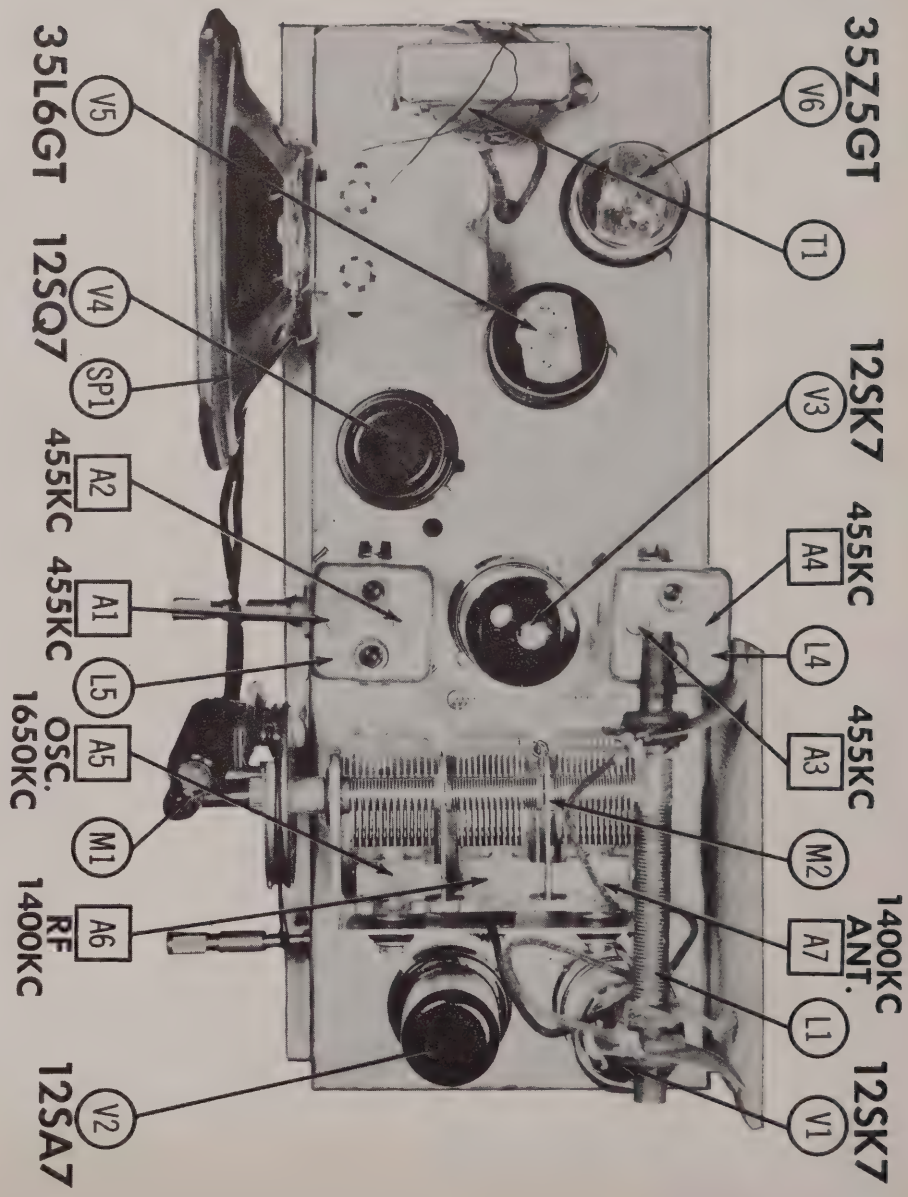
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ARVIN PART No.	IRC PART No.	NOTES
R3	2200Ω	½	C20061-222	BTS-2200	
R4	22KΩ	½	C20061-223	BTS-22K	
R5	6.8Meg	½	C20061-685	BTS-6.8Meg	
R6	68Ω	½	C20061-680	BTS-68	
R7	1Meg	½	C20061-105	BTS-1Meg	
R8	33KΩ	½	C20061-333	BTS-33K	
R9	3.3Meg	½	C20061-335	BTS-3.3Meg	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ARVIN PART No.	IRC PART No.	NOTES
R10	330KΩ	½	C20061-334	BTS-330K	
R11	150Ω	½	C20061-151	BTS-150	
R12	1000Ω	2	C20223-102	BTB-1000	
R13	15Ω	½	C20061-150		
R14	150Ω	½	C20061-151	BTS-150	
R15	330KΩ	½	C20061-334	BTS-330K	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: ARVIN PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T1	3KΩ	3.1Ω	110Ω	.3Ω	AC23164-1	A-3849 ①	A-3031 ②	RO-302	S-4X ①	① Drill one new mounting hole. ② Disregard primary tap.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	ARVIN PART No.	JENSEN PART No.	QUAM PART No.	
SP1	5"	PM	3.1Ω	N-25756	ST-105 Mod. P5-X	4A1	

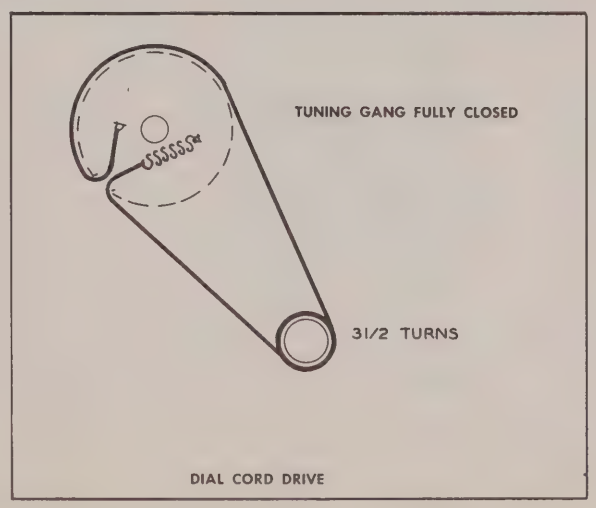
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	ARVIN PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	0Ω	.5Ω	AD25657-1				
L2	RF Coil	2.2Ω	8Ω	AC25706-1	14-1072	BC-382 *	70-RF	
L3	Osc.Coil	.6Ω	6.5Ω	AC23751-1	14-1074		70-Osc. †	
L4	Input IF	18Ω	18Ω	AC25728-1	16-6666	BC-368	112-C1	
L5	Output IF	19Ω	19Ω	AC25729-1	16-6667	BC-371	112-C4	

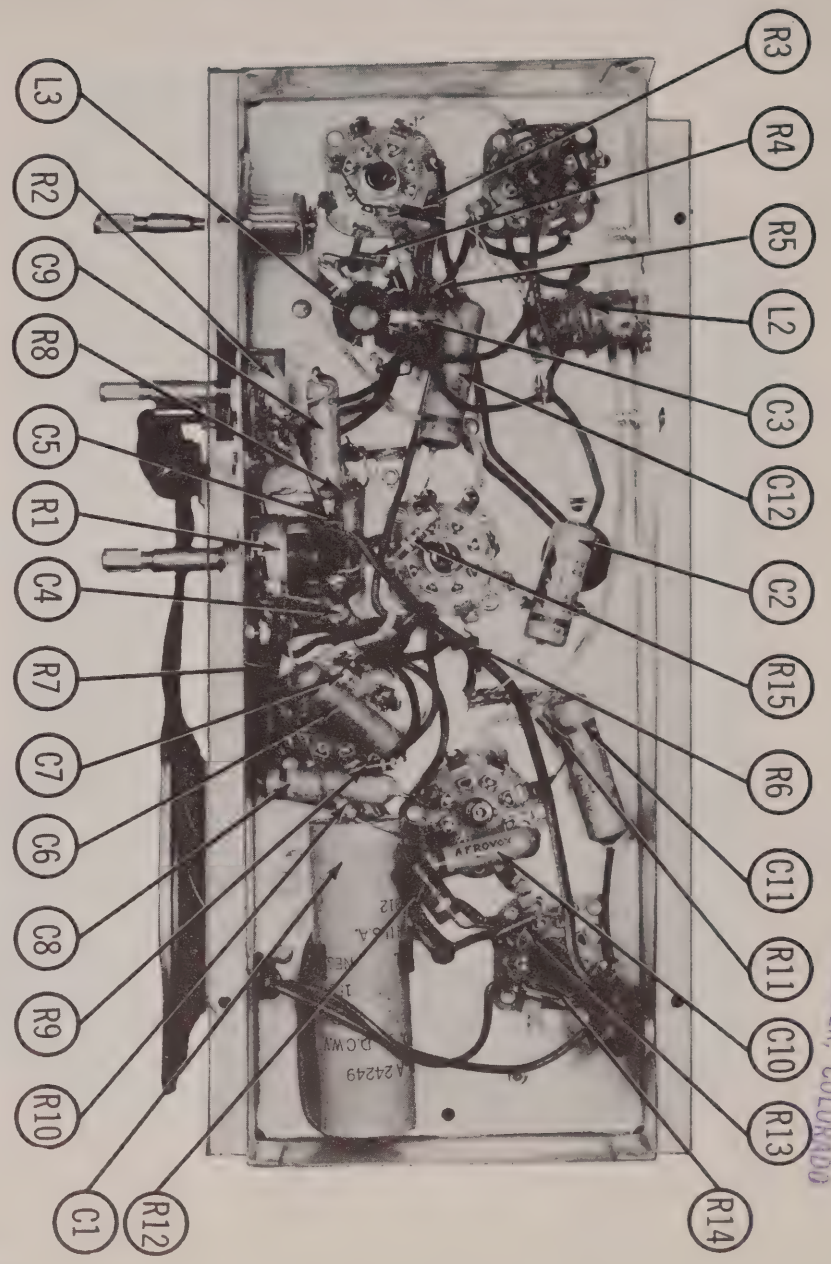
* Drill mounting hole.
† Disregard tap on secondary winding.

MISCELLANEOUS

ITEM No.	PART NAME	ARVIN PART No.	NOTES
M1	Dial Light		Type #47
M2	Tuning Cap.	C40548	(43-437MMF, 26-395MMF, 23-180MMF)
	Cabinet	R25763-1	GP brown
	Cabinet	R25763-3	Rosewood
	Cabinet	R25763-4	Ebony
	Back Cover	C40605-1	
	Dial Glass	E40618	
	Knob	A40549-1	Ivory (3 required)
	Knob	A40549-2	Willowgreen (3 required)
	Knob	A40549-3	Brown (3 required)
	Knob	A40549-4	Black (3 required)
	Knob	A40549-5	Saddle tan (3 required)
	Dial Pointer	D40554-1	Ivory
	Dial Pointer	D40554-2	Willow green
	Dial Pointer	D40554-3	Brown
	Dial Pointer	D40554-4	Black
	Dial Pointer	D40554-5	Saddle tan

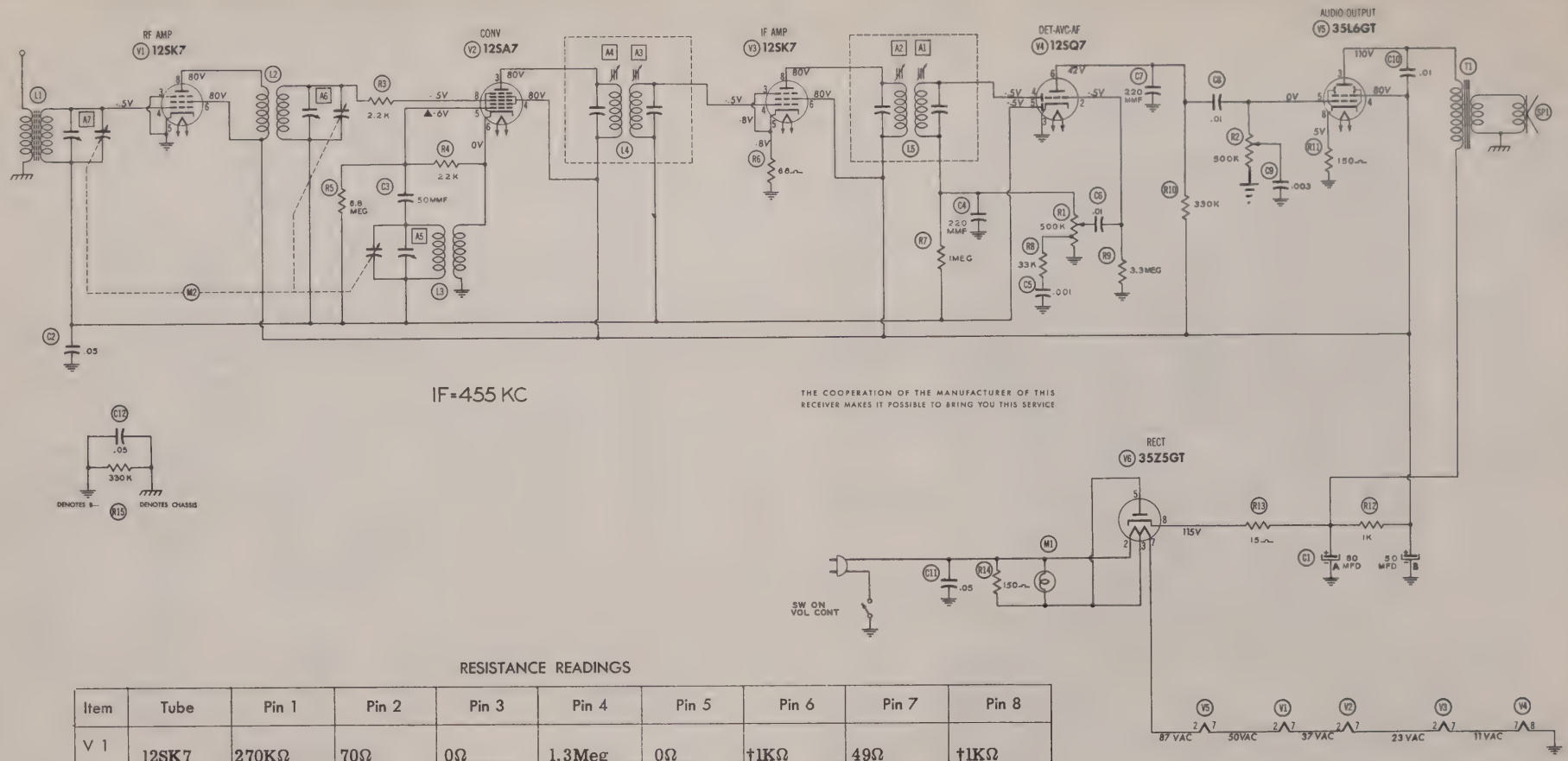


CHASSIS—BOTTOM VIEW



PROPERTY OF
L. F. BLANKENSHIP
3024 MEADE ST.
DENVER, COLORADO

ARVIN MODEL 760T



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SK7	270KΩ	70Ω	0Ω	1.3Meg	0Ω	†1KΩ	49Ω	†1KΩ
V 2	12SA7	270KΩ	49Ω	†1KΩ	†1KΩ	22KΩ	.6Ω	33Ω	1.3Meg
V 3	12SK7	270KΩ	33Ω	68Ω	1.3Meg	68Ω	†1KΩ	15Ω	†1KΩ
V 4	12SQ7	270KΩ	3.3Meg	0Ω	500KΩ	1.3Meg	†330KΩ	15Ω	0Ω
V 5	35L6GT	INF	120Ω	†125Ω	†1KΩ	500KΩ	INF	70Ω	150Ω
V 6	35Z5GT	INF	170Ω	163Ω	INF	163Ω	†15Ω	120Ω	500KΩ

▲ TAKEN WITH VACUUM TUBE VOLTMETER
† MEASURED FROM PIN 8 OF V6.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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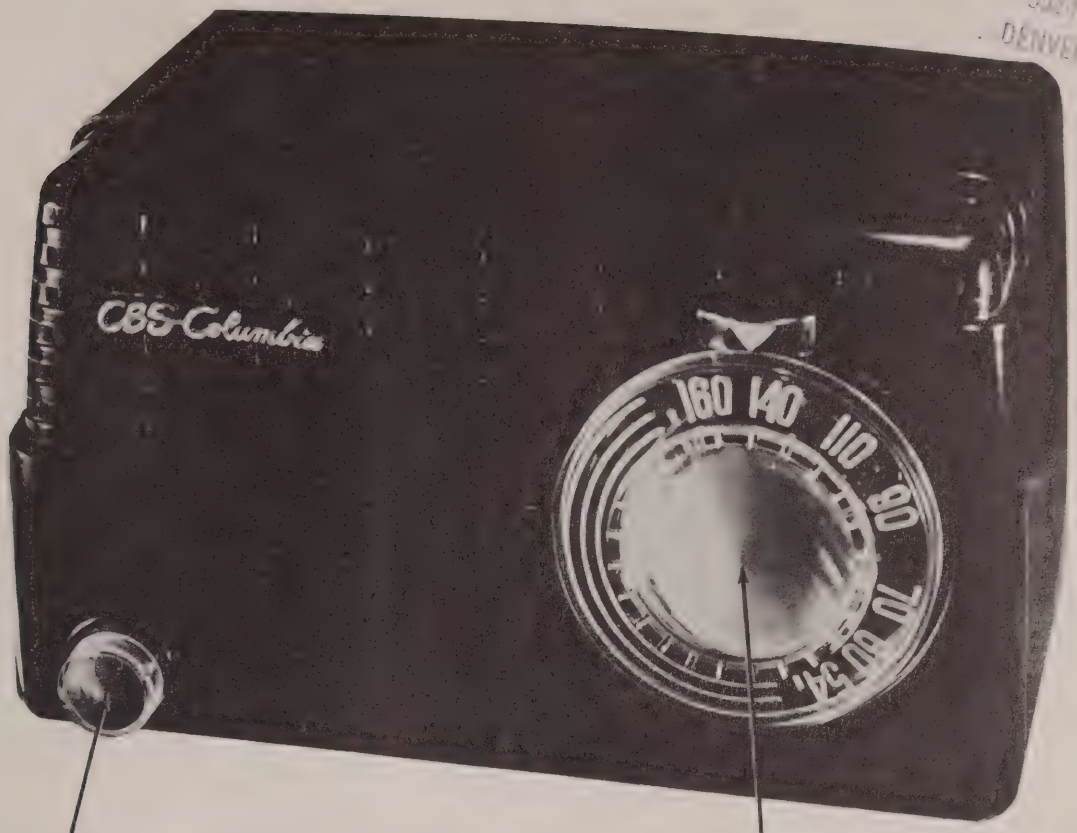
223-3

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PROPERTY OF
L. F. DEARTH-NEMIR
3024 MARKET ST.
DENVER, COLORADO

CBS-COLUMBIA
MODELS 515A, 516A, 517A



ON-OFF SWITCH
VOLUME CONTROL

TUNING CONTROL

CBS-COLUMBIA
MODELS 515A, 516A, 517A

TRADE NAME	CBS Columbia Models 515A, 516A, 517A
MANUFACTURER	CBS Columbia, Inc., 3400 47th. Ave., Long Island City 1, N.Y.
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types 12SA7GT Conv., 12SK7GT IF Amp., 12SQ7GT Det.-AVC-AF Amp., 50L6GT Audio Output, 35Z5GT Rectifier
POWER SUPPLY	110-120 Volts AC-DC RATING .22 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	535-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to antenna stator lug. Low side to B-.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1600KC	1600KC	"	A5	"
3.		"	1400KC	Tune to 1400KC signal	"	A6	"

To set pointer turn tuning gang fully closed and set pointer to coincide with last reference mark to right of "54" on the dial and the low frequency index mark on the cabinet.

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PARTS LIST AND DESCRIPTIONS

CBS COLUMBIA
MODEL 515A

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		CBS-COLUMBIA PART No.	STANDARD REPLACEMENT		
V1	Converter	12SA7GT	12SA7GT	8AD	
V2	IF Amplifier	12SK7GT	12SK7GT	8N	
V3	Det.-AVC-AF Amp	12SQ7GT	12SQ7GT	8Q	
V4	Audio Output	50L6GT	50L6GT	7S	
V5	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	CBS-Columbia PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	50	150		PRS150/50-30		BRP5315A		TCD497	TVA-2450	Yellow
B	30	150								Red
C2	.05	400		P488-05	DF-503	PTE4S5		PT415	4TM-S5	
C3	220	500		SI220	D6-221		GP2K-221	UC-5322	5GA-T22	
C4	.002	400		P488-002	D6-202	PTE6D2	GP2-333-202	PT622	6TM-D2	Note 1
C5	.001	400		P688-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C6	.01	400		P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C7	.01	400		P488-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C8	.05	400		489ZX-05		PJ4S5		PT411	4TM-S5	
C9	.1	400		P488-1		PTE4P1		PT401	4TM-P1	

Note 1. Some Models use a .005MFD capacitor in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	CBS-Columbia PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	PA-24127	Q13-133	AG-60-Z	BSK-60-S	U-48	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch			76-1	SWB	Not Req.	US-Z6	Attach to R1A

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CBS-Columbia PART No.	IRC PART No.	
R2	20KΩ	½			
R3	3.3Meg	½		BTS-3.3Meg	
R4	10Meg	½		BTS-10Meg	
R5	180KΩ	½		BTS-180K	Note 1.

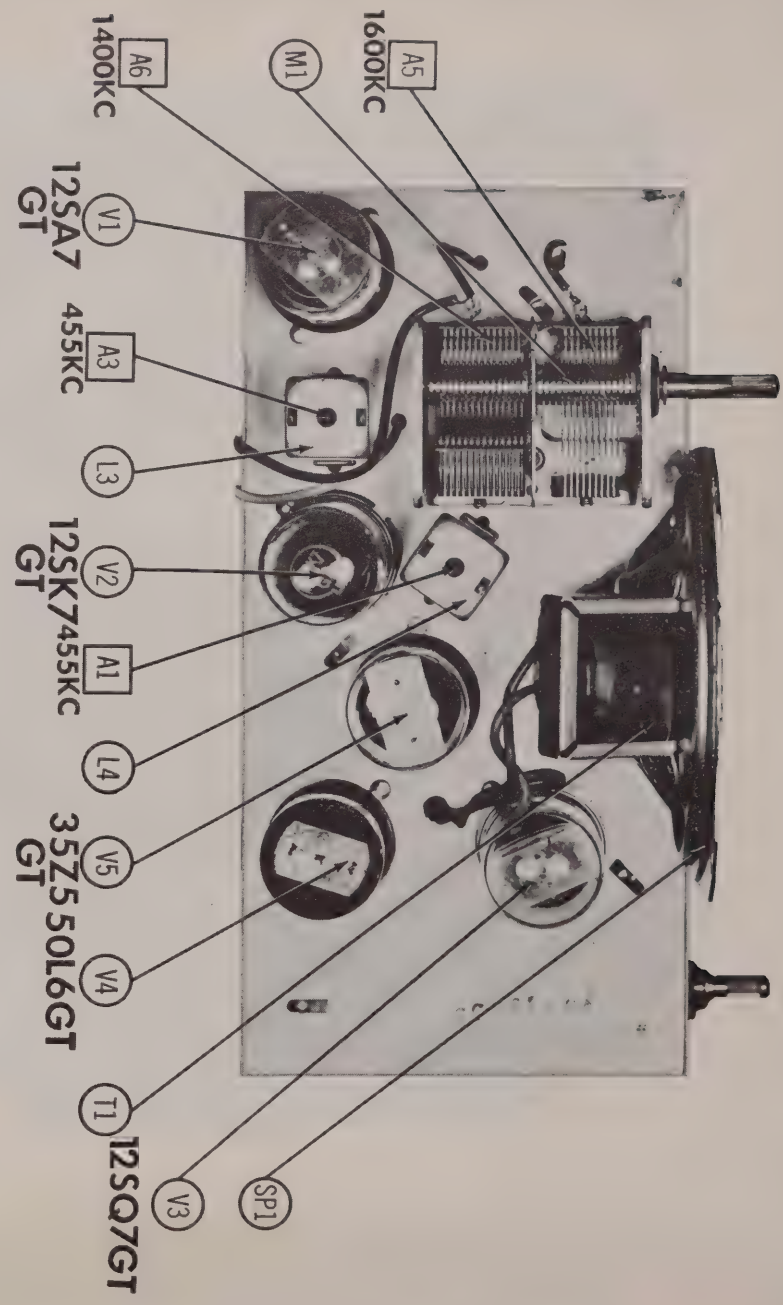
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CBS-Columbia PART No.	IRC PART No.	
R6	330KΩ	½		BTS-330K	
R7	2200Ω	2		BTS-2200	
R8	22Ω	½			
R9	330KΩ	½		BTS-330K	Note 2

Note 1. Some models may use a 220KΩ resistor in this application.
Note 2. Some models may use a 270KΩ resistor in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		CBS-Columbia PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2.1KΩ	3.2Ω	225Ω	.7Ω	7386	A-3332	A-3025	RO-2 ①	S-2X ①	① Drill one new mounting hole.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	CBS-Columbia PART No.	JENSEN PART No.	QUAM PART No.	
SP1	4"	PM	3.2Ω	PC-58128-2	ST-113 Mod. P4-X	4A07	

COILS (RF-IF)

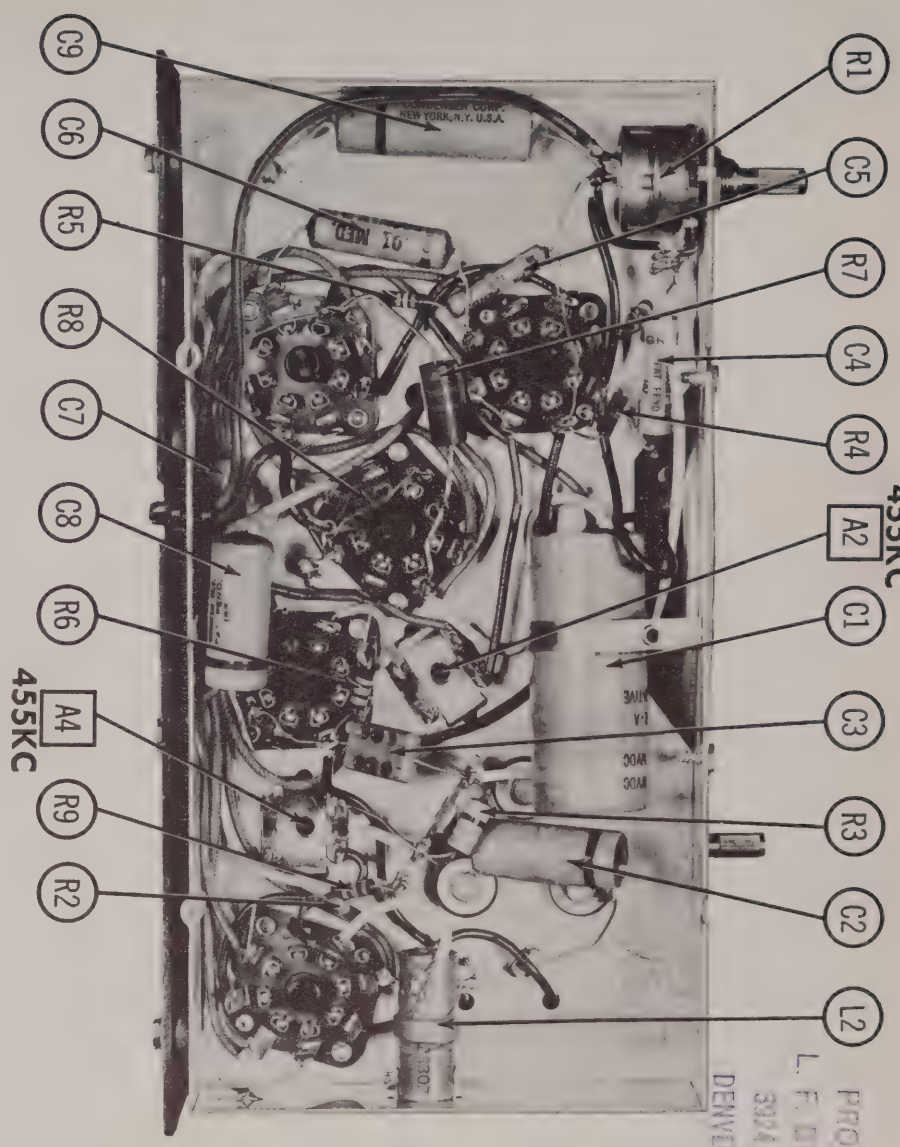
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	CBS-Columbia PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	3Ω						
L2	Osc. Coil	.8Ω	9Ω		14-1073		69-Osc. *	
L3	Input IF	18Ω	18Ω	PB-33102A	16-6758	BC-352	12-C1	
L4	Output IF	18Ω	18Ω	PB-33102A	16-6758	BC-353	12-C2	

* Drill mounting hole.

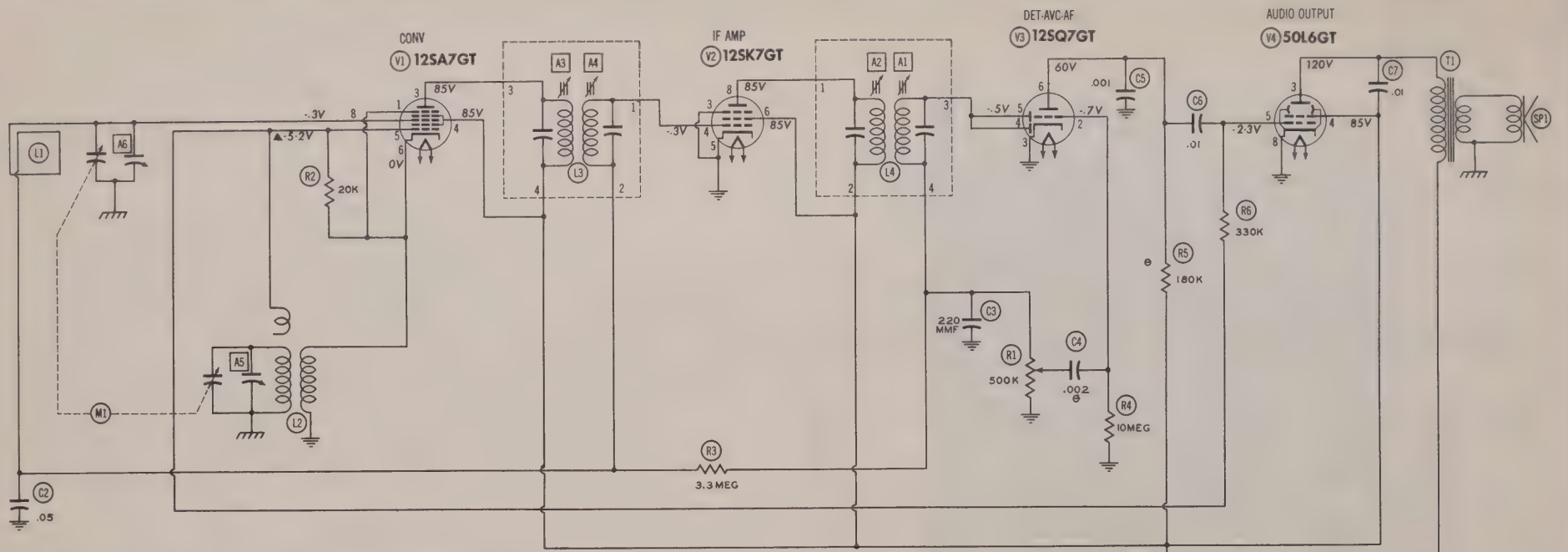
MISCELLANEOUS

ITEM No.	PART NAME	CBS-Columbia PART No.	NOTES
M1	Tuning Cap.	PB-16112	31-462MMF, 20-185MMF

CHASSIS—BOTTOM VIEW



CBS COLUMBIA
MODEL 515A



IF=455KC

DENOTES B— DENOTES CHASSIS

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12SA7GT	.8Ω	25Ω	†2.2KΩ	†2.2KΩ	20KΩ	.8Ω	13Ω	3.8Meg
V 2	12SK7GT	330KΩ	37Ω	0Ω	3.8Meg	0Ω	†2.2KΩ	25Ω	†2.2KΩ
V 3	12SQ7GT	330KΩ	10Meg	0Ω	500KΩ	500KΩ	†180KΩ	13Ω	0Ω
V 4	50L6GT	330KΩ	85Ω	†225Ω	†2.2KΩ	330KΩ	†2.2KΩ	37Ω	0Ω
V 5	35Z5GT	330KΩ	110Ω	105Ω	INF	130Ω	†0Ω	85Ω	100KΩ

♦ TAKEN WITH VACUUM TUBE VOLTMETER
† MEASURED FROM PIN 8 OF V5

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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223-4

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PHOTOFACT* Folder

CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

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Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

MODEL F-17TOLH

CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

OF
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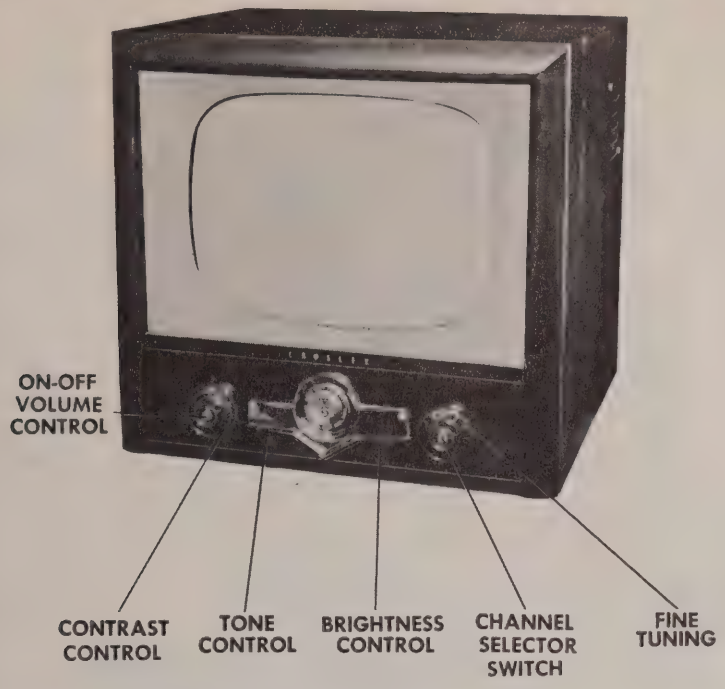
DATE 12–53 SET 223 FOLDER 5

PHOTOFACT* Folder
*TRADE MARK

CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU



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CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

CROSLEY MODEL F-17TOLH

TRADE NAME	CROSLEY MODELS	CHASSIS
	F-17TOLBH, F-17TOLH	402
	F-17TOLBU, F-17TOLU	402-1
	F-21CDLBH, F-21CDLH, F-21COLBH, F-21COLH	404
	F-21CDLBU, F-21CDLU, F-21COLBU, F-21COLU	404-1
	F-12TOLBH, F-21TOLH	403
	F-21TOLBU, F-21TOLU	403-1

MANUFACTURER	Crosley Corp., 1329 Arlington St., Cincinnati, Ohio
TYPE SET	Television Receiver
TUBES	Eighteen
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING .59 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83UHF, Video IF 26.4MC, Sound IF 21.9MC (Intercarrier)

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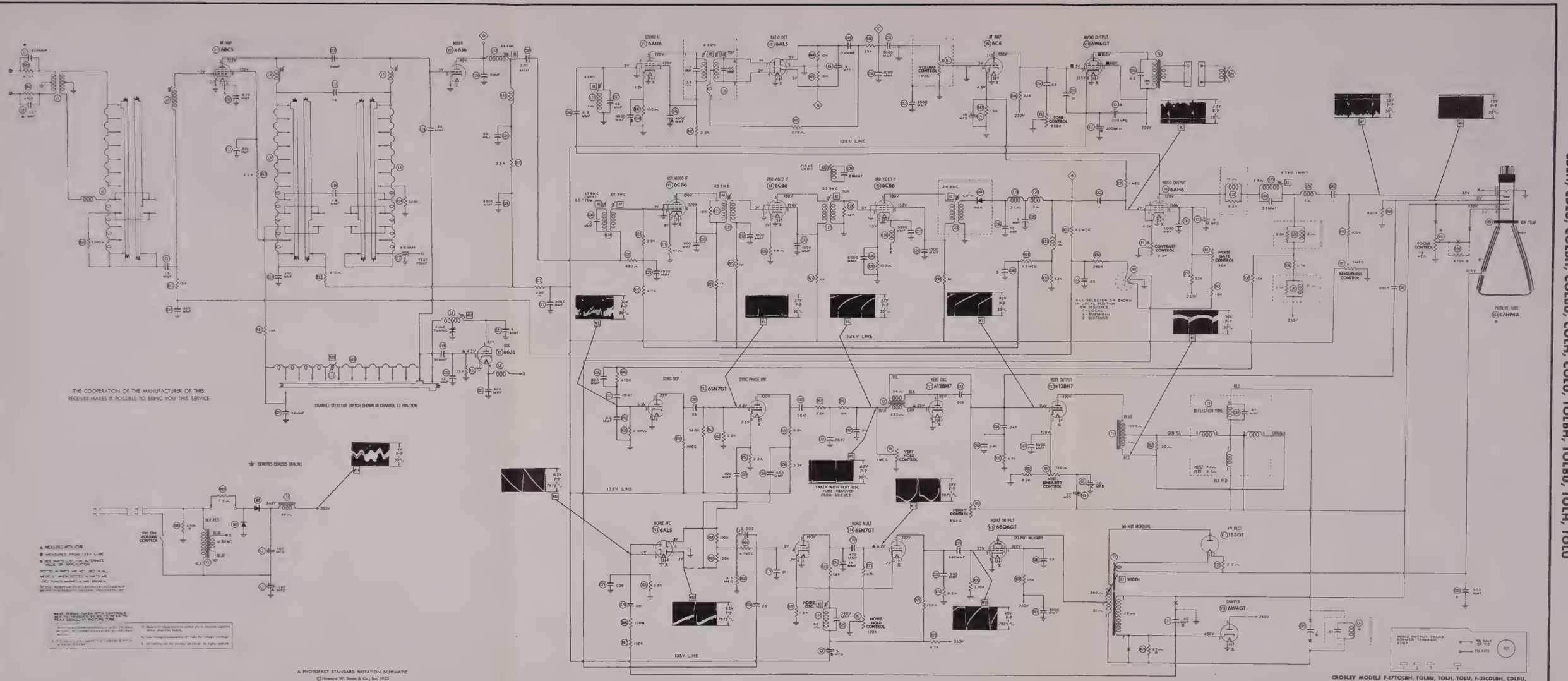
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
DENOTES CHASSIS GROUND
135V LINE
TAKEN WITH VERT OSC TUBE REMOVED FROM SOCKET
DO NOT MEASURE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1953
CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

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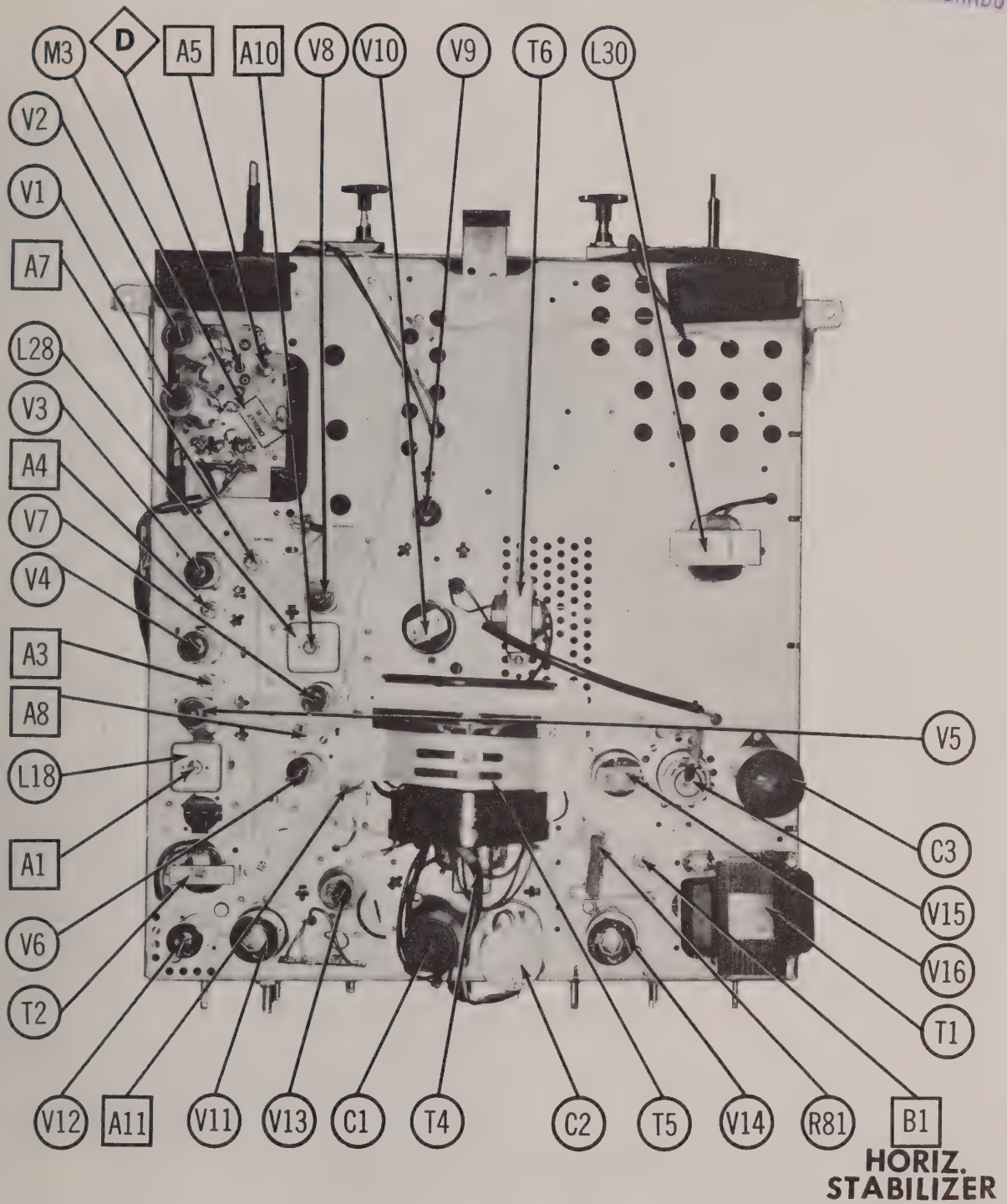
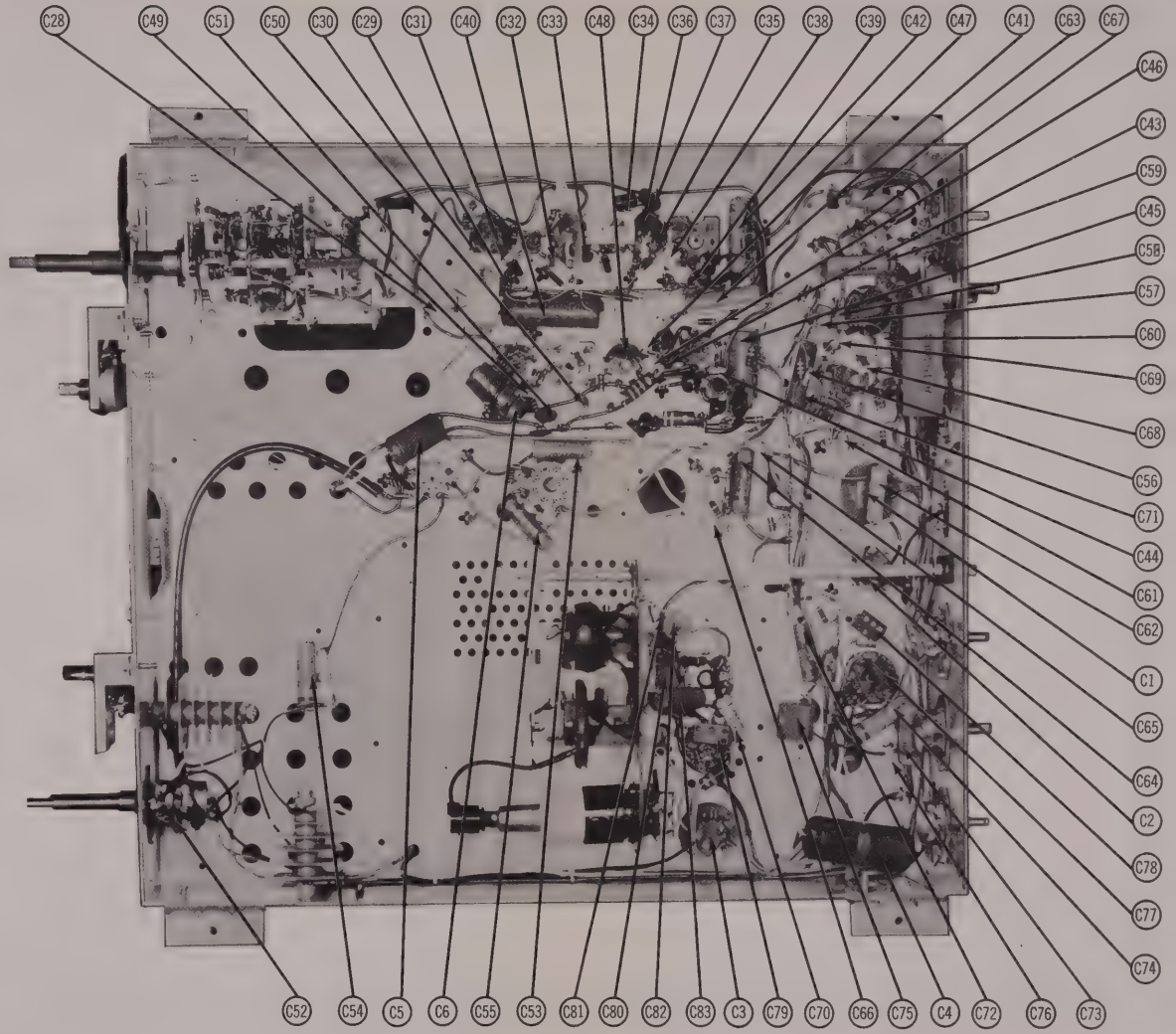


CHASSIS TOP VIEW

SET 223 FOLDER 5



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART

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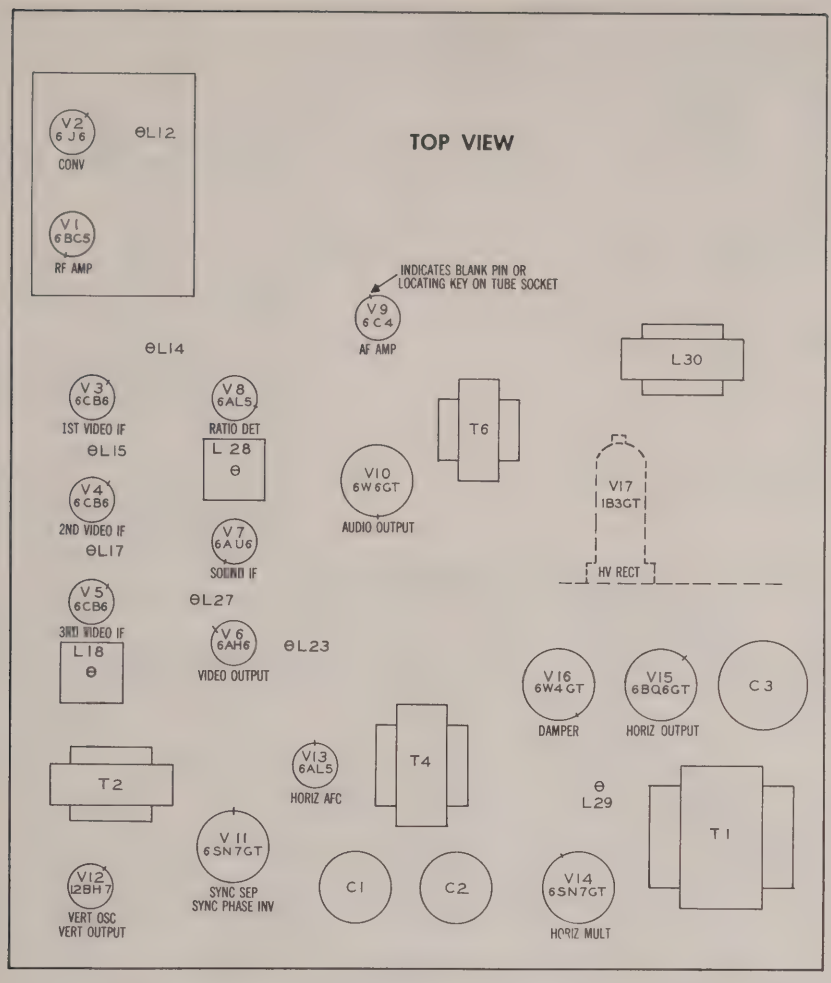

TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - Selenium Rectifiers (M1 & M2)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V10
No pic, no sound, has snow - V1, V2, V3,
No pic, has sound, has raster - V6, V18
Has pic, no sound - V7, V8, V9, V10

SYNC FAILURE
No vert. sync - V11, V12
No horiz. sync - V11, V13, V14
No vert. or horiz. sync - V10, V11

SWEEP FAILURE
No raster, has sound - V14, V15, V16, V17, V18
No vertical deflection - V12
Poor vert. linearity or foldover - V12
Poor horiz. linearity or foldover - V14, V15, V16
Narrow picture - V14, V15, V16, V17, M1, M2
Vert. off freq. - V11, V12
Horiz. off freq. - V11, V13, V14

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator to disable the high voltage.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 which has pin removed.
This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the negative lead of a 3 volt bias supply to the ungrounded side of C40. Connect the positive lead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	24.4MC (Unmod.)	Any	DC probe to point (A). Common to chassis.	A1	Adjust for maximum deflection. Attenuate signal generator to maintain approximately 2 volt at VTVM.
2.	"	"	22.9MC	"	"	A2	"
3.	"	"	21.9MC	"	"	A3	Adjust for MINIMUM deflection. Repeat steps 2 and 3.
4.	"	"	25.5MC	"	"	A4	Adjust for maximum deflection.
5.	"	"	24.4MC	"	"	A5	Connect a 100Ω resistor in series with a 1000MMF capacitor across L14 (1st. Video IF). Adjust A5 (on tuner) for maximum deflection. Attenuate generator to maintain approximately 2 volts at VTVM. Remove 100Ω resistor and 1000MMF Capacitor.
6.	"	"	27.9MC	"	"	A6	Adjust for MINIMUM deflection.
7.	"	"	25.5MC	"	"	A7	Connect 100Ω resistor in series with 1000MMF capacitor from point (D) to tuner chassis. Adjust for maximum deflection. Attenuate signal generator to maintain 2 volts at VTVM. Remove 100Ω resistor and 1000MMF capacitor. Repeat steps 5 and 6.

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	24MC (10MC Swp)	20.4MC 21.2MC 21.9MC 26.4MC 27.9MC 28.5MC	Any	Vert. Amp. to point (A). Low side to chassis.		Check for response curve similar to Fig. 1. If necessary retouch A1, A2, A4, A5 and A7 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
9.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe to point (B). Common to chassis.	A8, A9	Adjust for maximum deflection.
10.	"	"	"	"	DC probe to point (C). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (B). Low side to chassis.	A8, A9	Disconnect stabilizer capacitor C6. Adjust for curve of maximum amplitude and symmetry as in Fig. 2.
10.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A10	Reconnect stabilizer capacitor C6. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
11.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe thru detector (Fig. 4) to pin 11 of picture tube. Common to chassis.	A11	Adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
Allow the receiver to warm up for approximately five minutes.
Set the station selector switch to the highest channel available in that area. Adjust contrast and volume for normal reception.
Set the fine tuning control at the center of its range. With a non-metallic alignment tool adjust the slotted head brass screw (A12) located at the upper right of the tuning shaft, for clearest and sharpest detail in the picture.
Check any other channels, 13 to 7 receivable in that area and make slight compromise adjustment of A12 if necessary for best reception of all high band channels.
For low band channels set station selector switch to the channel nearest channel 6 and adjust the slotted brass screw (A13) just below the tuning shaft, for clearest and sharpest detail in the picture.

RF ALIGNMENT

The RF portion of this receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required.

ALIGNMENT INSTRUCTIONS (cont)

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UHF TUNER ALIGNMENT

Remove UHF converter from receiver chassis.
Remove toggle coupling from the switch throw arm as follows:
1. Rotate UHF tuning control to the right until the pin on the rear of the drive pulley is free from the toggle coupling.
2. Loosen two set screws in switch throw arm collar and remove from switch shaft.
3. Turn the switch to the right to UHF position. The contact blade on the switch rotor must make contact and be centered on the two switch fingers with the red wires attached.
Leave switch in this position during alignment.
Connect UHF converter output to the VHF tuner RF input terminals.
Reconnect the B+ and filament leads of the tuner to their original points from which they were removed. Connect UHF converter chassis to VHF receiver chassis by mounting the UHF tuner at right angles to the TV chassis with one mounting screw. Mounting tuner in this fashion will aid in keeping all leads as SHORT AS POSSIBLE.
Set VHF tuner to channel 6.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
12.	Fig. 5	Thru antenna matching network (Fig.5) to UHF antenna terminals.	460MC (Unmod.)	UHF Tuner shaft fully counter clockwise	DC probe to point (A). Common to chassis.	A14	Adjust A15 so that the flat side of the head is 5/8" above the chassis. Adjust A14 for maximum deflection.
13.	"	"	904MC	UHF tuner shaft fully clockwise	"	A16	Adjust A16 up or down for maximum deflection. Repeat steps 12 and 13 until maximum deflection is obtained.
14.	"	"	460MC	UHF tuner shaft fully counter clockwise	"	A15, A18	Preset A17 to MINIMUM capacity by turning screw counter clockwise. Adjust A15 and A18 for maximum deflection.
15.	"	"	904MC	UHF tuner shaft fully clockwise	"	A19, A20	Adjust for maximum deflection by forming larger or smaller loop. Repeat steps 14 and 15 until maximum deflection is obtained.
16.	"	"	"	"	"	A17	Adjust for maximum deflection.

UHF TUNER ALIGNMENT CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Set VHF tuner to channel 6.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
17.	Fig. 5	Thru antenna matching network (Fig.5) to UHF antenna terminals.	473MC (20MC Swp)	471.25MC 475.75MC	14	Vert. Amp. to point (A). Low side to chassis.		Check for response curve similar to Fig.6. If necessary SLIGHTLY retouch A14 thru A20 for desired response.
18.	"	"	887MC (20MC swp)	885.25MC 889.75MC	83	"		"

19. Turn power off and remove test equipment. Re-engage the toggle coupling in the pin on the switch throw arm and the pin on the drive pulley as follows:
1. Turn tuning shaft clockwise until pin on rear of drive pulley is toward base of chassis.
2. Turn tuning shaft counter clockwise and guide pin on rear of drive pulley into fork of toggle coupling, then continue to turn tuning shaft counter clockwise to stop. The coupling should now be in proper operating position.
3. With switch set to VHF (CCW position) replace siwtch throw arm so that pin on arm engages fork of toggle coupling. In this position, it is approximately 30 degrees clockwise from horizontal. Tighten two set screws in switch throw arm collar.
4. Check function switch for proper operation. With tuner shaft turned all the way to the left, all VHF position contacts must be fully made and all UHF position contacts must be fully made and all VHF position contacts fully broken when tuner shaft is 7.5 dgrees or more from full counter clockwise position.
Replace the UHF converter on the VHF receiver chassis.

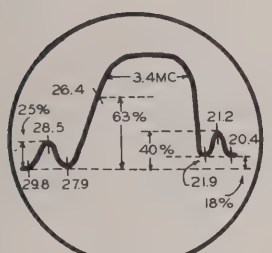


FIG. 1

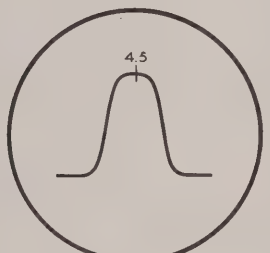


FIG. 2

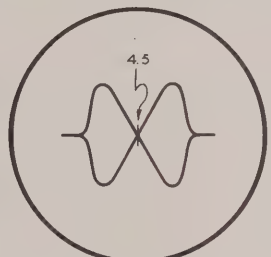


FIG. 3

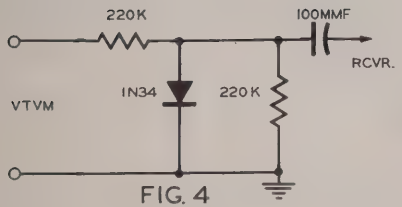


FIG. 4

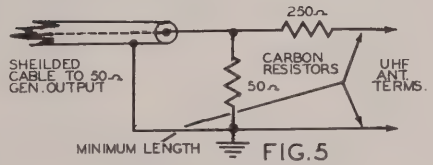


FIG. 5

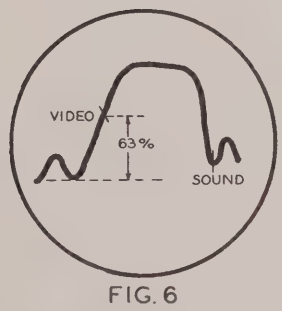
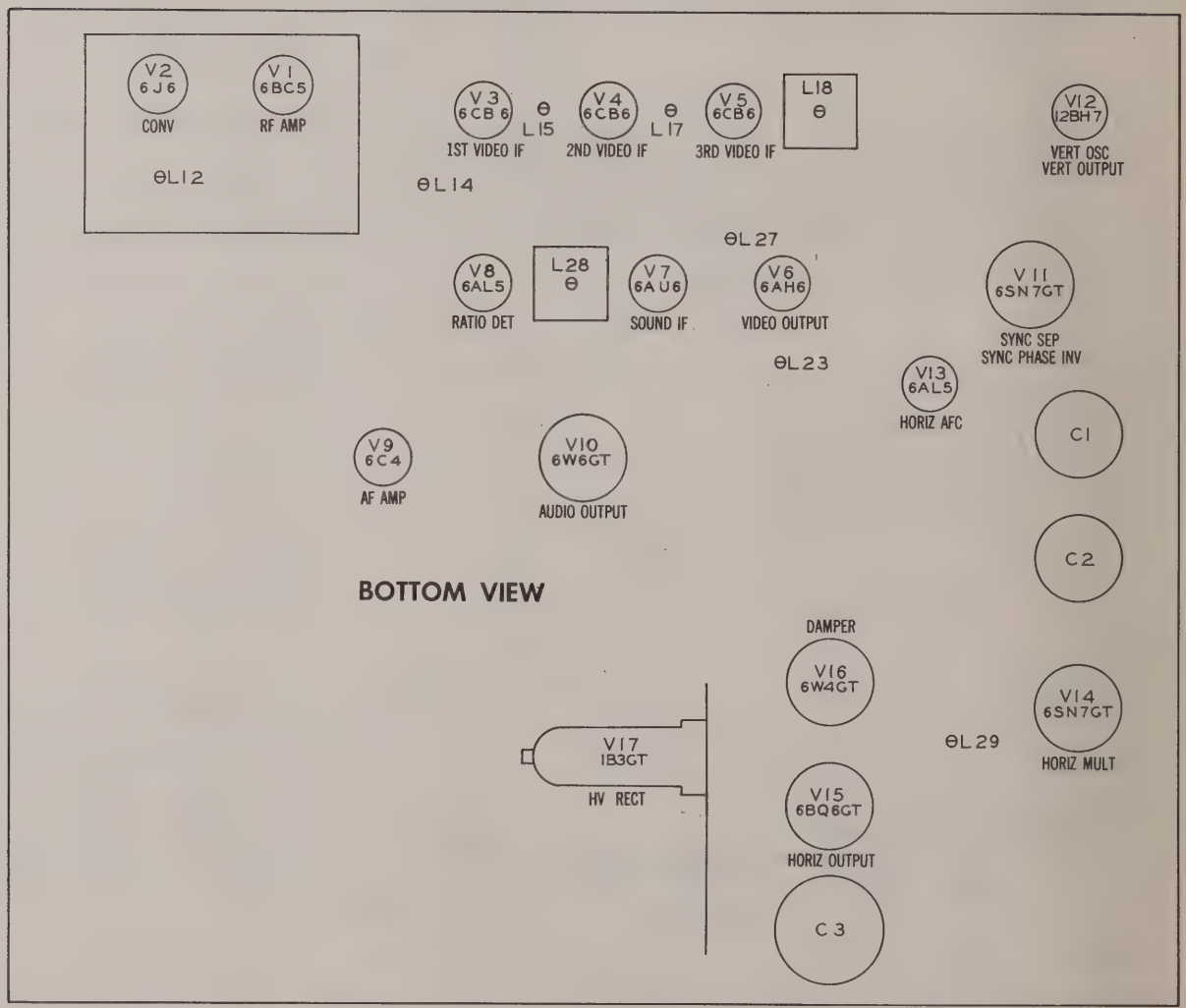


FIG. 6

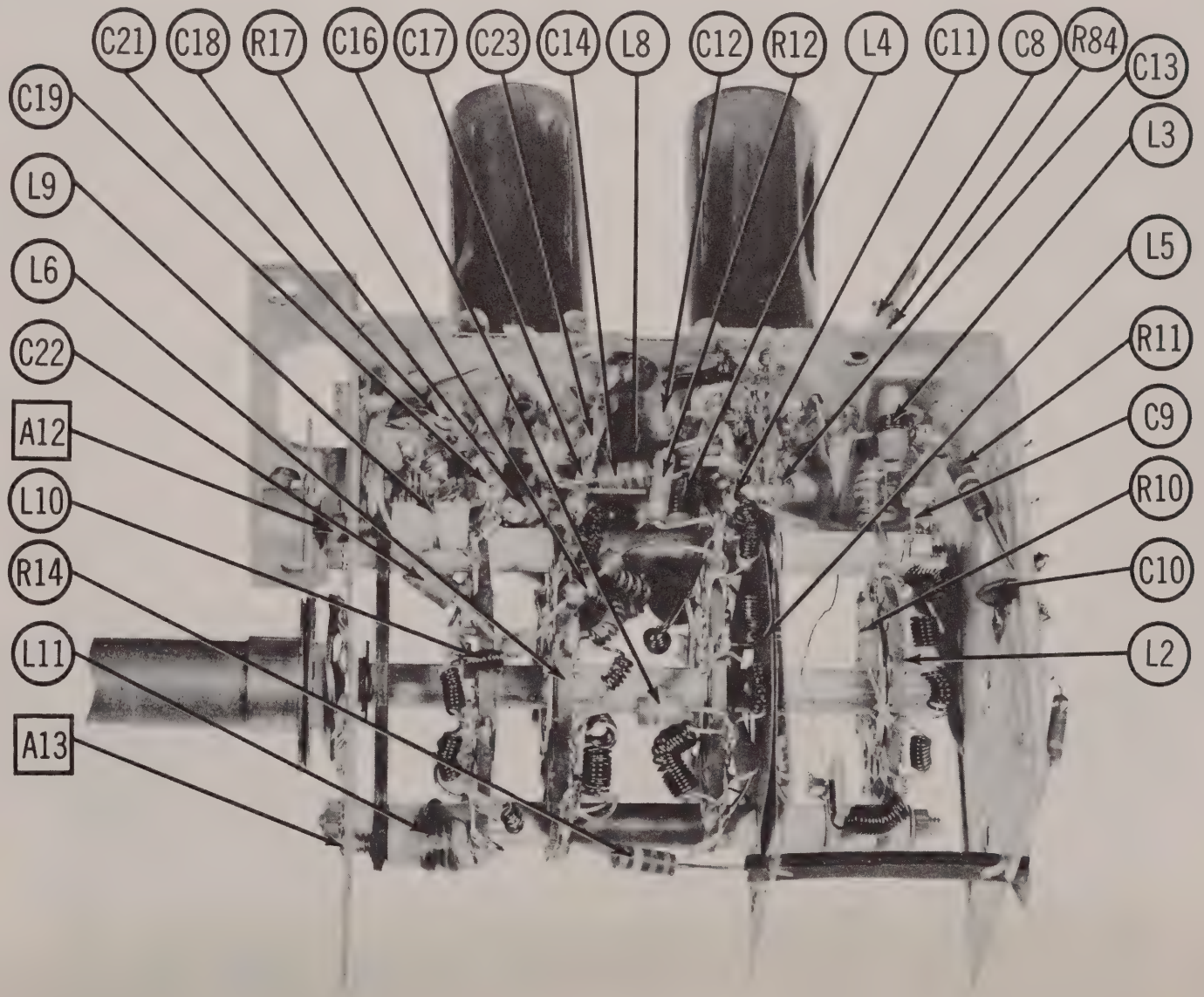
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BC5	2.2Meg	0Ω	0Ω	.1Ω	■700Ω	■2.9KΩ	0Ω		
V 2	6J6	■10.7KΩ	■3.5KΩ	0Ω	.1Ω	220KΩ	15KΩ	0Ω		
V 3	6CB6	1.5Meg	47Ω	0Ω	.1Ω	■1KΩ	■1KΩ	0Ω		
V 4	6CB6	1.5Meg	68Ω	0Ω	.1Ω	■1KΩ	■1KΩ	0Ω		
V 5	6CB6	.4Ω	150Ω	0Ω	.1Ω	■1KΩ	■1KΩ	0Ω		
V 6	6AH6	1Meg	200Ω	0Ω	.1Ω	♦4.8KΩ	♦33KΩ	200Ω		
V 7	6AU6	1Ω	0Ω	.1Ω	0Ω	■2.2KΩ	■2.2KΩ	150Ω		
V 8	6AL5	10KΩ	10KΩ	.1Ω	0Ω	INF	0Ω	INF		
V 9	6C4	♦33KΩ	INF	0Ω	.1Ω	♦33KΩ	100KΩ	1.5KΩ		
V 10	6W6GT	INF	.1Ω	♦230Ω	♦60Ω	♦33KΩ	INF	0Ω	100KΩ	
V 11	6SN7GT	2.2Meg	■1Meg	0Ω	22KΩ	■10.1KΩ	2.2KΩ	.1Ω	0Ω	
V 12	12BH7	▲1KΩ	▲2.8Meg	9KΩ	.1Ω	.1Ω	▲2.8Meg	680KΩ	0Ω	0Ω
V 13	6AL5	4.8Meg	4.8Meg	0Ω	.1Ω	22KΩ	0Ω	22KΩ		
V 14	6SN7GT	95KΩ	♦125KΩ	1.2KΩ	9.4Meg	♦10.5KΩ	1.2KΩ	.1Ω	0Ω	
V 15	6BQ6GT	INF	0Ω	♦125KΩ	♦10KΩ	330KΩ	22KΩ	.1Ω	0Ω	TOP CAP ▲21Ω
V 16	6W4GT	INF	480KΩ	480KΩ	INF	60Ω	880KΩ	0Ω	.1Ω	
V 17	1B3GT		PIN 8	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲281Ω
V 18	17HP4A	0Ω	802KΩ	PIN 6 15KΩ	PIN 10 ▲22Ω	PIN 11 ■180KΩ	PIN 12 .1Ω			

■ MEASURED FROM 135V LINE
♦ MEASURED FROM OUTPUT OF M2
▲ MEASURED FROM PIN 3 OF V16



TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE

RF TUNER-LEFT SIDE

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[illegible]
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TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage."

INSUFFICIENT SWEEP

Check by substitution V14, V15 and V16. Check waveform W13.

If Satisfactory	If Unsatisfactory
Check C80, R77, T3, T5A, C83 and other associated components.	Check C77, C78, C79, R75, R76 and other associated circuit components.

DRIVE LINES

Check by substitution V14, V15 and V16. Check C77, C78, C79, R75, R76, R74, T3, T5A, C80, C83, T3, T5A, C81, C82 and other components associated with the horizontal output and damper stages.

COMPRESSED LEFT SIDE

Check by substitution V14, V15, and V16. Check T3, T5A, C81, C82, C80 C83 and other components associated with V16.

FOLDS

Check by substitution V14, V15 and V16. Check components associated with these stages.

XMAS TREE EFFECT

Substitute V14. Check C76, C77, C78, C79, L29, R70, R71, R73, R74, R75 and other associated circuit components.

VERTICAL

LOSS OF SWEEP

Substitute V12. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T4 and T5B.	Check T2, height control and other associated components.

INSUFFICIENT SWEEP

Substitute V12. Check adjustment of height and vertical linearity controls. Proceed as outlined under "Loss of Sweep."

COMPRESSED AT BOTTOM

Substitute V12. Check C65, C66, R59, height control and other associated components.

COMPRESSED AT TOP

Substitute V12. Check T4, T5B and other associated components especially C67 and C2C.

FOLDS

Substitute V12. Check height control, C65, C66 and other associated circuit components.

SYNC

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Check by substitution V11 and V12. Check waveform W5.

If Satisfactory	If Unsatisfactory
Check T2 and other components associated with V12.	Check vertical integrator network and other components associated with V11.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Substitute V14 and V13. Check components associated with these stages especially C76, C77, C78 and C79.

HORIZONTAL AND VERTICAL SYNC CRITICAL

Check by substitution V6, and V11. Check signal at W3 for signal overload and/or sync clipping.

If Satisfactory	If Unsatisfactory
Check components associated with V11.	Check video IF and output stages.

HORIZONTAL BENDING OR S-ING

Check by substitution V14 and V15. Check components that form the horizontal AFC network (C72, C73, R68 and R69).

VIDEO

LOSS OF VIDEO

Substitute V6. Check R40, L26 and C45. Check picture tube and associated components.

SOUND BARS (4.5MC BEAT)

Check setting of local oscillator and adjustment of the fine tuning. Check adjustments A11 and A8. Check video IF alignment.

NEGATIVE PIX

Substitute V6. Check video detector crystal and assembly. Check setting of AGC switch. Check video IF component including tubes. Check picture tube and other associated components.

POOR CONTRAST

Check by substitution V3, V4, V5 and V6. Check video detector crystal and assembly. Check picture tube and other associated circuit components.

SMEAR

Substitute V6. Check video detector crystal and assembly. Check L22, L24, L25, C42, C45 and C43. Check R35, R36, R37 and R40 for change of value. Check picture tube and other associated circuit components.

WIDE BLACK BAR ACROSS PIX

Check V1, V2, V3, V4, V5, and V6 for heater to cathode leakage. Check picture tube and B+ filter capacitors.

AUDIO

WEAK OR NO SOUND

Check by substitution V7, V8, V9 and V10. Check stages of V9 and V10 using an audio signal generator. Apply signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V9 and V10.

BUZZ

Check adjustment of A9 and A10. Adjust for mimimum buzz with maximum sound. If buzz is still objectionable substitute V8 and readjust A10. Check C6 and C49.

DISTORTED

Check by substitution V7, V8, V9 and V10. Check stages of V9 and V10 using an audio signal generator and scope. Apply audio signal across R1B. Connect scope across primary of T6.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V9 and V10.

DENVER, COLORADO

CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

UHF TUNER SCHEMATIC

UHF CONVERTER USED ON TV CHASSIS 402-1, 403-1, & 404-1

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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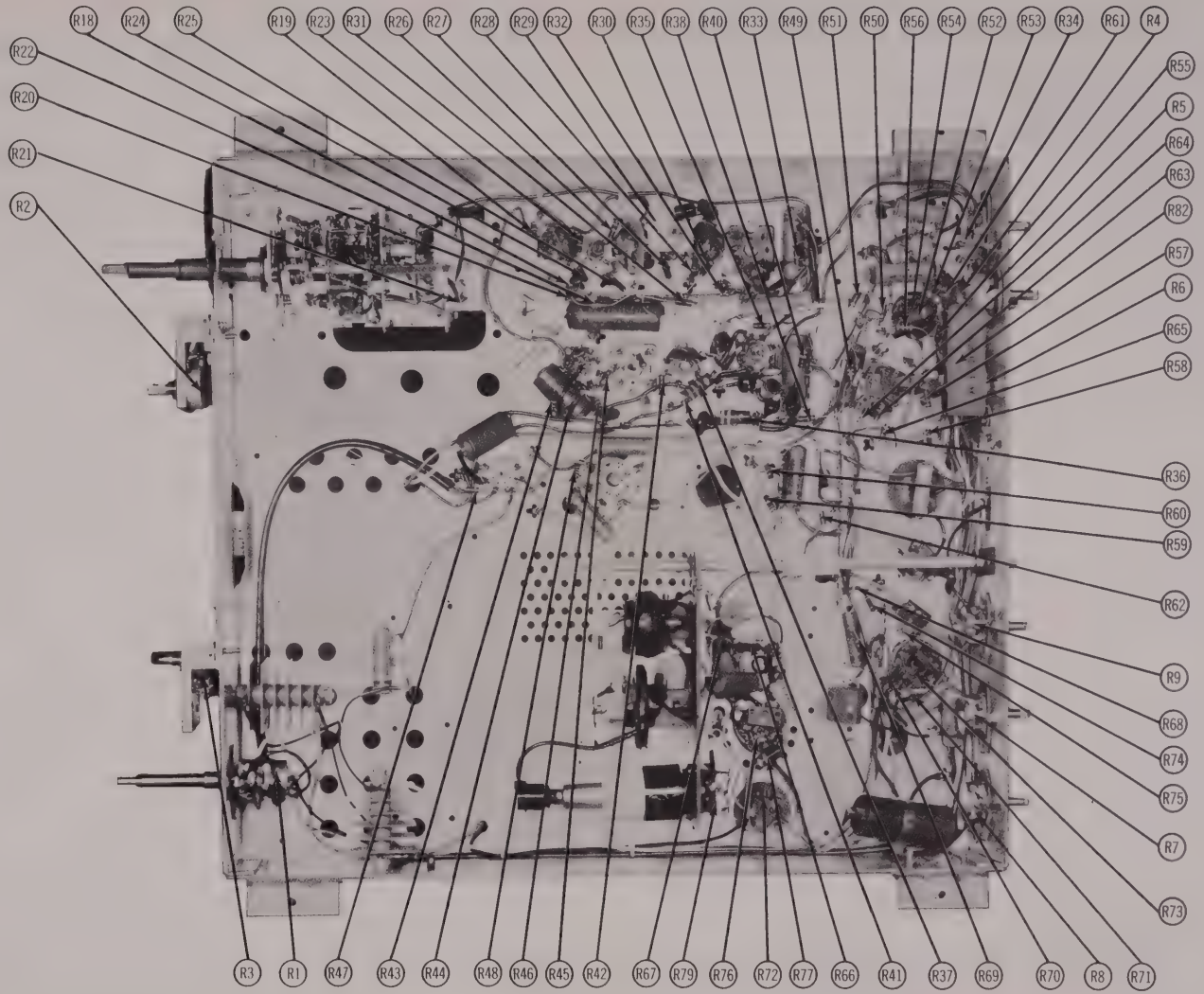
PROPERTY OF
L. F. CLARK
3944 MEADE ST
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

CROSLEY MODELS F-17TOLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLBU, TOLH, TOLU

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: CROSLEY PART No.	STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	RF Amplifier	6BC5	6 BC5	7BD	
V2	Converter	6J6	6J6	7BF	
V3	1st Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output	6AH6	6AH6	7BK	
V7	Sound IF Amp.	6AU6	6AU6	7BK	
V8	Ratio Detector	6AL5	6AL5	6BT	
V9	AF Amplifier	6C4	6C4	6BG	
V10	Audio Output	6W6GT	6W6GT	7B	
V11	Sync Separator-Sync Phase Inv.	6SN7GT	6SN7GT	8BD	
V12	Vert. Oscillator Vert. Output	12BH7	12BH7	9A	
V13	Horiz. AFC	6AL5	6AL5	6BT	
V14	Horiz. Mult.	6SN7GT	6SN7GT	8BD	
V15	Horiz. Output	6BQ6GT	6BQ6GT	8AM	
V16	Damper	6W4GT	6W4GT	4CG	
V17	HV Rectifier	1B3GT	1B3GT	3C	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: CROSLEY PART No.	SYLVANIA PART No.	GENERAL ELECTRIC PART No.	RTMA BASE TYPE	NOTES
V18A	17HP4A	17HP4A	17HP4A/17RP4	12C	① Circuit Changes Necessary to replace with 17HP4 .
B	17HP4	17HP4①	17HP4①	12C	
		17RP4		12C	
C	21MP4	21MP4	21MP4	12C	
D	21AP4	21AP4	21AP4	12C	21" Models
E	21ZP4A	21ZP4A		12C	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CROSLEY PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1	140	150	155685	AFH51-70		XA004		FP117	TVL-1428	
C2A	140	150	155438	AFH84-125		DU10		FP419.4	TVL-4559	
B	≋200	150						TC48		
C	≋30	150								
D	≋10	300								
C3A	≋200	150	155436	AFH82-109		BO78		FP216.1	TVL-3444	
B	≋5	150								
C4	30	450	154097	PR8450/20		BR2045A		TC75	TVA-1709	
C5	10	50	154104	PR850/10		BR105		TC32	TVA-1304	
C6	5	50	154103	PR8150/4		BR550		TC30	TVA-1303	
C7	330		137727-129	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	Note 1
C8	330		137727-129	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	Note 1
C9	50			SI50	D6-150		GP1K-150	UC-5415	5GA-Q15	
C10	500			BPD-0008	DD-102	TM5T8	80L-001	DC-521	5HK-D1	
C11	470			SI470	D6-471		GP2K-471	UC-5347	5GA-T47	
C12	800			BPD-0008	DD-102	TM5T8	80L-001	DC-521	5HK-D1	
C13	800			BPD-0008	DD-102	TM5T8	80L-001	DC-521	5HK-D1	
C14	.18									
C15	.56									
C16	1.8									
C17	470			SI470	D6-470		GP2K-471	UC-5347	5GA-T47	
C18	.24									
C19	18			SI0N750	TCN-18		N750K-100	NT-541	5TCU-Q1	
C20	12						N330K-040			
C21	4									
C22	.56									
C23	800			BPD-0008	DD-102	TM5T8	80L-001	DC-521	5HK-D1	
C24	18			SI0	D6-150		GP1K-150	UC-5415	5GA-T15	
C25	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C26	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C27	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C28	330		137727-129	SI330	D6-331		GP2K-331	UC-5333	5GA-T33	
C29	1000		144675-28	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C30	110	500					GP1K-111			
C31	1000		144675-28	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C32	1000		144675-28	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C33	1000		144675-38	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C34	68	500		1409-000007		5R5T7			MS-47	
C35	1000		144675-28	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C36	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C37	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C38	10		137727-125	SI10	D6-100		GP1K-100	UC-541	5GA-Q1	
C39	5		137727-103	SI5	TCZ-4.7		GP1K-050	ZT-556	5GA-Y5	
C40	.5	100	154157	P388-5		PJ3P5		PT405	2TM-P5	
C41	.05	200	33001-17	P388-05	DF-503	PJ3S5		PT415	2TM-S5	
C42	.1	200	33001-19	P388-1	DF-104	PJ3P1		PT401	2TM-P1	
C43	5000		144675-3	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C44	33		137727-126	SI33N750	TCN-33		N750K-330		5TCU-Q33	
C45	.1	400	33001-19	P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C46	2.2		154100-4	SI2.2NP0	TCZ-3.3		NP0K-2R2		5TCCB-V22	
C47	68		137727-133				N080-338-680			
C48A	4000		144675-8	BPD-2X004	D6-402 D6-402	TM5DD4	832-004	DCD-534	5HK-2D4	
B	4000									
C49	330		137727-129	SI330	D6-331		GP2K-331	UC-5322	5GA-T22	
C50	1000		144675-28	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C51	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C52	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C53	.01	400	33001-13	P488-01	D5-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C54	.03	400	33001-82	P688-03		PTE6S3		PT613	6TM-S3	
C55	.02	200	33001-80	P488-02	DF-203	PTE4S2		PT413	4TM-S2	
C56	220		137727-131	SI220	D6-221		GP2K-331	UC-5322	5GA-T22	
C57	.0047	400	33477-39	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C58	33		137727-126	SI33	D6-330		GP2K-331	UC-5322	5GA-T22	
C59	.0047	400	33477-39	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CROSLEY PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C61	.0047	400	33477-39	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C62	.01	400	33478-41	P488-01	D5-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C63	.006	600	33001-76	P688-006	D6-602	PTE6D6	GP2-333-602	PT616	6TM-D6	
C64	.0005	1000	33001-5						MB-T5	
C65	.047	400	33477-45	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C66	.047	400	33477-45	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C67	5000		144675-3	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C68	1000		137727-132	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C69	1000		137727-132	BPD-001	DD-102	TM5D1	80L-001	DC-521	5HK-D1	
C70	.001	1000	33478-108	P1068-001		PTE10D1		PT1021	MD-D1	
C71	.006	600	146434-16	P688-006	D6-602	PTE6D6	GP2-333-602	PT626	6TM-D6	
C72	.003	600	33001-76	P688-003	D6-302	PTE6D3	GP2-333-302	PT623	6TM-D3	
C73	.01	600	33001-15	P688-01	D6-103	PTE6S1	GP2-333-103	PT611	6TM-S1	
C74	.03	400	33001-82	P688-03		PTE6S3		PT613	6TM-S3	
C75	3900	500	137498-30	1464-004		DDR5D4		MCB3453	MB-34	
C76	75		137727-124	1469-000075				MCB230		
C77	470	500	137498-36	1469-0005		5N8T5		MCB245	MB-35	
C78	390	500	137498-31	1469-0004		5N5T4		MCB243	MB-34	
C79	560	500	137499-34							
C80	.05	400	33001-17	P488-05	DF-503	PTK4S5		PT415	4TM-S5	
C81	5000		144675-2	BPD-005	MD-502	TM5D5	81L-005	DC-525	5HK-D5	
C82	120	3000	154988						30GA-T12	
C83	.1	200	33001-19	P288-1	DF-104	PJ2P1		PT401	2TM-P1	Note 2
C84	47	2000	15421	HVD30-000047					30GA-Q47	
C85	500	30000	15109		TV3-502	MM-C20T5	413-501	HV20035A	20DK-T5	Note 3

Note 1. Some models use 470MMF in this application.
Note 2. Ch. 403, 403-1, 404, 404-1. Replace C83 with a coil-capacitor assembly (part #15456).
Note 3. Used in Ch. 403, 403-1 only.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CROSLEY PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2500Ω		C154085-C	QJ-370 *	RTV-370	SBB-727-S	UF252L	Contrast - Panel
B	1Meg		Not Reg.		Not Reg.	Not Reg.	UR16A †	Volume - Rear
C	Switch		Not Reg.		Not Reg.	Not Reg.	US-26	Attach to R1B
R2	5Meg		B155352	QJ7-141				Brightness - Panel
R3A	250KΩ		B155389	QJ3-130	AG-54-Z	AB-51	U-44	Tone - Rear
B	Shaft		Not Reg.	Not Reg.	K38-3	AK-4	Not Reg.	Attach to R3A
R4	90KΩ		B155578				U-87	Noise Gate - Note 1
R5A	750Ω		B154088-A	QJ1-105	AG-8-8	AB-5	U-4	Vert. Linearity
B	Shaft		Not Reg.	Not Reg.	R8-2	AK-4	Not Reg.	Attach to R5A
R6A	5Meg		B154088	QJ1-141	AG-85-8	AB-57	SU-67	Height- Note 2
B	Shaft		Not Reg.	Not Reg.	FK3-1/4	AK-1	Not Reg.	Attach to R6A
R7A	170KΩ		B155511	QJ1-129	AG-56-8	AB-46	U-43	Horiz. Hold
B	Shaft		Not Reg.	Not Reg.	R8-2	AK-4	Not Reg.	Attach to R7A
R8	1Meg		B155610	QJ1-136			U-54	Vert. Hold - Note 3
R9A	1.5Meg		B154094-A	QJ1-138	AG-83-8	AB-75	U-155	Focus - Note 4
B	Shaft		Not Reg.	Not Reg.	R8-3	AK-1	Not Reg.	Attach to R9A

*CONCENTRIKIT EQUIVALENT - KIT K-2, BASE ELEMENTS & SHAFTS B17-11, P1-204 (Panel)
B13-137 & P6-202 (Rear) & SWITCH 76-1.

† Universal Replacement (Mallory exact duplicate part #UR330S)

Note 1. This control has an open spot and the MFr. shows it on the print, therefore, we are not replacing this control.
Note 2. Connect a 1Meg resistor between the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end out, terminals down).
Note 3. Connect a 330KΩ resistor between the right hand terminal of the control and viewed from shaft end out, terminals down).
Note 4. Not used in all Models.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: CROSLEY PART No.	IRC PART No.	NOTES
R10	2200Ω	½		BTS-2200	
R11	15KΩ	½			
R12	2200Ω	½		BTS-2200	
R13	470Ω	½		BTS-470	
R14	220KΩ	½			
R15	330Ω	½		BTS-3300	
R16	15KΩ	½			
R17	10KΩ	½			
R18	3.9KΩ	½	39375-63	BTS-3900	
R19	47Ω	½	39376-9	BTS-47	
R20	680Ω	½	39376-23	BTS-680	
R21	220Ω	½	39374-17	BTS-220	
R22	4.7KΩ	½	39376-53	BTS-4700	
R23	10KΩ	½	39375-73	BTS-10K	
R24	1000Ω	½	39376-25	BTS-1000	
R25	1000Ω	½	39376-25	BTS-1000	
R26	68Ω	½	39376-11	BTS-68	
R27	1000Ω	½	39376-25	BTS-1000	
R28	12KΩ	½	39375-25	BTS-12 K	
R29	150Ω	½	39376-15	BTS-150	
R30	1000Ω	½	39376-25	BTS-1000	
R31	1.5Meg	½	39376-65	BTS-1.5Meg	
R32	5.6KΩ	½	39375-67	BTS-5600	
R33	2.2Meg	½	39376-69	BTS-2.2Meg	
R34	390KΩ	½	39376-56	BTS-390K	
R35	1Meg	½	39376-61	BTS-1Meg	
R36	47KΩ 5%	1	39375-361		
R37	33KΩ	½	39374-219	BTA-33K	
R38	10KΩ	½	39376-57	BTS-10K	
R39	470KΩ	½	39374-57	BTS-470K	Note 1
R40	100KΩ	½	39376-49	BTS-100K	
R41	15Ω	½	39376-15	BTS-150	
R42	2.2KΩ	½	39374-29	BTS-2200	
R43	10KΩ	½	39375-73	BTS-10K	
R44	10KΩ	½	39375-73	BTS-10K	
R45	270Ω	½	39376-18	BTS-270	
R46	33KΩ	½	39376-43	BTS-33K	
R47	1.5KΩ	½	39376-27	BTS-1500	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: CROSLEY PART No.	IRC PART No.	NOTES
R48	33KΩ	½	39374-43	BTS-33K	
R49	470KΩ	½	39374-57	BTS-470K	
R50	2.2Meg	½	39374-69	BTS-2.2Meg	
R51	1Meg	½	39374-61	BTS-1Meg	
R52	560KΩ	1	39374-148	BTA-560K	
R53	22KΩ	½	39374-41	BTS-220	
R54	2.2KΩ	½	39374-29	BTS-2200	
R55	6.8KΩ	½	39374-35	BTS-6800	
R56	3.3KΩ	½	39374-31	BTS-3300	
R57	22KΩ	½	39374-41	BTS-22K	
R58	10KΩ	½	39374-37	BTS-10K	
R59	4.7KΩ	½	39374-33	BTS-4700	
R60	820KΩ	½	39374-80	BTS-820K	
R61	12KΩ	½	39374-125	BTS-120	
R62	120Ω	½	39374-14	BTS-120	
R63	100KΩ	½	39374-49	BTS-100K	
R64	100KΩ	½	39374-49	BTS-100K	
R65	22KΩ	½	39374-41	BTS-22K	
R66	150KΩ	1	39374-139	BTA-150K	
R67	150KΩ	1	39374-139	BTA-150K	
R68	4.7Meg	½	39374-77	BTS-4.7Meg	
R69	4.7Meg	½	39374-77	BTS-4.7Meg	
R70	1200Ω	½	39374-26	BTS-1200	
R71	5600Ω	½	39374-34	BTS-5600	
R72	4.7KΩ	½	39374-33	BTS-4700	
R73	47KΩ	½	39374-45	BTS-47K	
R74	8.2KΩ	½	39374-38	BTS-8200	
R75	120KΩ	½	39374-50	BTS-120K	
R76	330KΩ	½	39374-55	BTS-330K	
R77	10KΩ	1	39374-213	BTA-10K	
R78	27Ω	½	39374-8	BTS-27	Note 1
R79	2.2Ω		39302-12		
R80	470KΩ	½	39374-57	BTS-470K	Note 1
R81	7.5Ω	5	154089		
R82	8700Ω	5	154084	13/4A-9000	
R83	470KΩ	½	39374-57	BTS-470K	
R84	470KΩ	½	39374-57	BTS-470K	

Note 1. Not used in all Models.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: CROSLEY PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.
T1	117VAC @ .59A	6.3VAC @ 8.8A			155390					

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC	REPLACEMENT DATA: CROSLEY PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	54Ω	235Ω	B-155255-1	A-8155	A-3003	TBO-5	A-97X		Vert. Osc. Trans.
T3	281Ωtap @ 21Ω	22Ω SEC. 2 0Ω	AD-155514-1A						Horiz. Output Trans.
T4	1100Ω tap @ .85Ω	43Ω	C-155572	A-8140 ① ②	A-3080 ③	TBO-9① ②	A-103X ④ ⑤		Vert. Output Trans.
T5A			AD-154231-6	DY-10A ⑥	MDF-74 ⑦ ⑧	TY-10⑦ ⑧	Y-20⑦ ⑧		Horiz. Deflection Coils Vert. Deflection Coils
B	3.7Ω		B-153586 ⑤ AD-154231-9⑥						

① Drill new mounting holes.
② Connect as auto transformer.
③ Use 50 to 1 turns ratio connected as auto transformer.
④ Drill one new mounting hole.
⑤ Yoke cover and positioning device, part of AD-154221-6.
⑥ Alternate yoke used on 21" Models.
⑦ Use original yoke cover and positning device.
⑧ Connect jumper from terminal #1 to terminal #5 or #8.
⑨ Use original deflection coil network.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: CROSLEY PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T6	2.2KΩ	3.7Ω	168Ω	.4Ω	154109-2A	A-3676	A-2928	RO-2	S-2X	

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: CROSLEY PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	5 1/4"	PM	3.7Ω	155739-1 128762-7 ① 128762-5 ②	ST-803 Mod. P535-V	52A1	① Alternate 5 1/4" PM Speaker ② 10" PM Speaker used in some Models

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: CROSLEY PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Trans.	0Ω CT	0Ω					Low Channel secondary-0Ω
L2	Ant. Coils	0Ω						
L3	Ant. Coil	0Ω						Channel 13
L4	RF Coil	0Ω						Channel 13
L5	RF Coils	0Ω						
L6	Mixer Grid Coils	0Ω						
L7	Mixer Grid Coil	0Ω						Channel 13
L8	Fil. Choke	0Ω						
L9	Osc. Plate Coil	0Ω CT						Channel 13
L10	Osc. Coils	0Ω						
L11	Osc. Coil	0Ω						Channel 6
L12	Conv. Plate	.1Ω						
L13	RF Choke	0Ω						2 Coils in series
L14	1st. Video IF	.2Ω		155304			6245	Includes trap
L15	2nd. Video IF	.3Ω	.3Ω	155319	17-1062		6250	
L16	Fil. Choke	0Ω						.06 Microhenry (Not used in all Models)
L17	3rd. Video IF	.4Ω	.4Ω	155348				Includes trap
L18	4th. Video IF	.5Ω	.5Ω	155594				Includes 1N64 Crystal (Crystal part #154111)
L19	Series Peaking Coil	3.1Ω		154376			6634	15.5 Microhenries
L20	Series Peaking Coil	7Ω		156035	19-3125		6153	117 Microhenries
L21	Shunt Peaking Coil	18Ω		156036	19-3500	TV-188	6174	464 Microhenries
L22	Series Peaking Coil	15Ω		154194	19-4412	TV-188 †	6648 †	414 Microhenries, wound on 8.2 K Ω resistor
L23	4.5MC Trap	2.8Ω		155446	20-1004	TV-151	1470	
L24	Shunt Peaking Coil	6Ω		154206	19-4121	TV-181 *	6643 *	106 Microhenries, wound on 6.8KΩ resistor
L25	Shunt Peaking Coil	21Ω		154178	19-4840			840 Microhenries, wound on 3.3KΩ resistor
L26	Series Peaking Coil	7Ω		156035	19-3125		6153	117 Microhenries
L27	Sound IF	1Ω		155442	17-2400	TV-181	1469	
L28	Ratio Det.	3.9Ω	.8ΩCT	154108	17-1053	TV-110	1468	Tertiary winding-.5Ω
L29	Horiz. Osc.	95Ω		154220	19-1578	TV-183	6210	
L30	Anti-Ringing			154186				Includes C83, used in Ch. 403, 403-1, 404, 404-1 only

* Parallel with 6.8KΩ resistor
† Parallel with 8.2KΩ resistor

CROSLEY MODELS F-177OLBH, TOLBU, TOLH, TOLU, F-21CDLBH, CDLBU, CDLH, CDLU, COLBH, COLBU, COLH, COLU, TOLBH, TOLH, TOLU

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	CROSLEY PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
L31	.190A	60Ω	1.1Hy.	155529-1	C-2326①	C-2996①	TR-1733①	C-21X①

① Drill one new mounting hole.

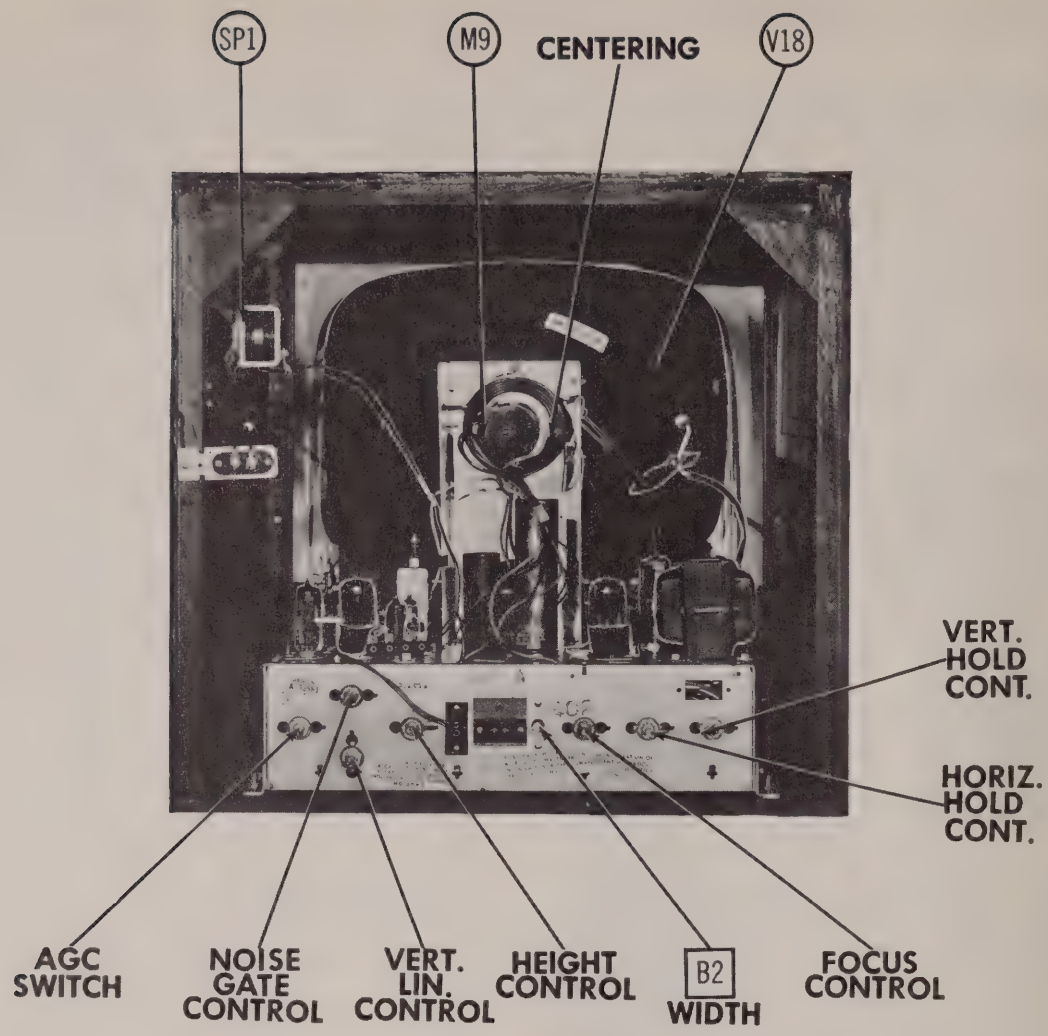
SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA					
	CURRENT	CROSLEY PART No.	SYLVANIA PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.
M1	.190A	A-154112-B	NH5	6Q4	1090A	6S300	300
M2	.190A	A-154112-B 155575-2①	NH5	6Q4	1090A	6S300	300

① Alternate selenium rectifier.

MISCELLANEOUS

ITEM No.	PART NAME	CROSLEY PART No.	NOTES
M3	RF Tuner	155398	VHF
M4	RF Tuner	156871	UHF equipped Models (Includes M5 and M6)
M5	Inductuner	155158	UHF equipped Models
M6	Crystal	151871	1N72 (UHF mixer)
M7	Crystal	154111	1N64 (Video Detector
M8	Switch	155554	Rotary - 3 pos ition AGC selector
M9	Ion Trap	153109-3	
	Cabinet	155302-1	Models F-17TOLH & F-17TOLU
	Cabinet	155302-2	Models F-17TOLBH & F-17TOLBU
	Cabinet	155250-1	Models F-21TOLH & F-21-TOLU
	Cabinet	155244-1	Models F-21COLH & F-21COLU
	Cabinet	155244-2	Models F-21COLBH & F-21COLBU
	Cabinet	155388	Models F-21CDLH & F-21CDLU
	Cabinet	155404	Models F-21CDLBH & F-21CDLBU
	Knob	154214-1	Fine tuning (Models F-17TOLH, F-17TOLU, F-21TOLH, F-21TOLU, F-21COLU, F-21CDLH, F21CDLU
	Knob	154216-1	Contrast (Models F-17TOLH, F-17TOLU, F-21TOLH, F-21TOLU, F-21COLH, F-21COLU, F-21CDLH, F-21CDLU)
	Knob	155513-1	Tone & Brightness (Models F-17TOLH, F-17TOLU, F-21TOLH, F-21TOLU, F-21COLH, F-21COLU, F-21CDLH, F-21CDLU)
	Knob	156206-1	Channel Selector (UHF) (Models F-17TOLH, F-17TOLU, F-21TOLH, F-21TOLU, F-21COLH, F-21COLU, F-21CDLH, F-21CDLU)
	Knob	156209-1	Volume (Models F-21COLH, F-21COLU, F-21CDLH, F-21CDLU, F-21COLH, F-21COLU, F-21CDLH, F-21CDLU)
	Knob	156217-1	Channel Selector (VHF) Models F-17TOLH, F-17TOLU, F-21TOLH, F-21TOLU, F-21COLH, F-21COLU, F-21CDLH, F-21CDLU)
	Knob	154265	AGC (All Models)
	Knob	154270	Vert. & Horiz. Hold (All Models)
	Knob	154216-2	Contrast (Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21TOLBU, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU
	Knob	154214-2	Fine Tuning (Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21TOLBU, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU
	Knob	155513-2	Tone & Brightness (Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21TOLBU, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU)
	Knob	156206-2	Channel Selector (UHF)(Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU)
	Knob	156209-2	Volume (Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21TOLBU, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU)
	Knob	156217-2	Channel Selector (VHF) (Models F-17TOLBH, F-17TOLBU, F-21TOLBH, F-21TOLBU, F-21COLBH, F-21COLBU, F-21CDLBH, F-21CDLBU)
	Mask	154154	17" Table Models
	Mask	154333-3	21" Table Models
	Mask	155724-1	Models F-21COLH, F-21COLU, F-21COLBH, F-21COLBU,
	Mask	155724-2	Models F-21CDLH, F-21CDLU, F-21CDLBH, F-21CDLBU
	Cabinet Back	155709	Includes power cable - Models F-17TOLH, F-17TOLBH
	Cabinet Back	155493	Includes power cable- Models F-17TOLU, F-17TOLBU
	Cabinet Back	155995	Includes power cable - Models F-21TOLH, F-21TOLBH
	Cabinet Back	155996	Includes power cable - Models F-21TOLU, F-21TOLBU
	Cabinet Back	155484	Models F-21COLH, F-21COLBH
	Cabinet Back	155598	Models F-21COLU, F-21COLBU
	Cabinet Back	155841	Models F-21CDLH, F-21CDLU
	Cabinet Back	155847	Models F-21CDLBH, F-21CDLBU
	Safety Glass	154101	17" Table Models
	Safety Glass	156811-1	21" Table Models
	Safety Glass	155350-1	Models F-21COLH, F-21COLU, F-21COLBH, F-21COLBU,
	Safety Glass	155350-5	Models F-21CDLH, F-21CDLU, F-21CDLBH, F-21CDLBU



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

If the horizontal hold is too critical adjust as follows:

1. Connect DC probe of VTVM to junction of R64 and R63 (green lead). Connect common lead to chassis.
2. Short pin 5 or 7(orange lead) of V13 to chassis and adjust VTVM to zero.
3. Remove short from pin 5or7 of V13. Do not readjust VTVM.
4. Connect a .1MFD 600V capacitor from the junction of L29, C75, and R71 (Red lead) to chassis.
5. Adjust horizontal hold control for zero on VTVM.
6. Remove the .1MFD capacitor used in step 4. Do not readjust horizontal hold control.
7. Adjust the horizontal oscillator slug (B1) for zero on VTVM.

Remove VTVM and check pull in range of horizontal hold which should be effective for approximately 50 degrees rotation.

Adjust the width control (B2) for a picture slightly wider than necessary to fill the picture mask horizontally.

Set the local-Surburban-Distance switch in the position which gives the best picture with minimum overloading when the contrast control is advanced.

TROUBLE SHOOTING AIDS (cont)

L. [illegible]
3931 MEADE ST
DENVER, COLORADO

POWER

DEAD SET

If filaments fail to light, check T1, AC interlock assembly and switch on volume control. If filaments light, check M1, M2 and other B+ filter and decoupling components.

SMALL AND/OR DIM PICTURE

Check M1 and M2. Check B+ filter and decoupling components.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V14, V15, V16, and V17. Check waveform W13.

If Satisfactory	If Unsatisfactory
Check T3, T5A, R77, C80, C82, C83, C85, R79 and other associated components.	Check C77, C78, C79, R71, R72 R75, R76, R70 and other associated circuit components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V14, V15, V16 and V17. Check B+ rectifiers and filter components. Check picture tube and associated components. Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V17, V16, V15 and V14. Check R79, C85, C83, C82, C80 T3, T5A. picture tube and other associated components. Check the low voltage power supply for proper voltage output.

GENERAL

RASTER SOUND NO PIX

See "Loss of Video".

RASTER NO SOUND NO PIX

Check by substitution V10, V6, V5, V4, V3, V2 and V1. Check associated circuit components especially components associated with V10.

NO RASTER NO SOUND

See "Dead Set".

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF Tuner Oscillator Circuit may be accomplished by removing the Channel Selector and Fine Tuning knobs.

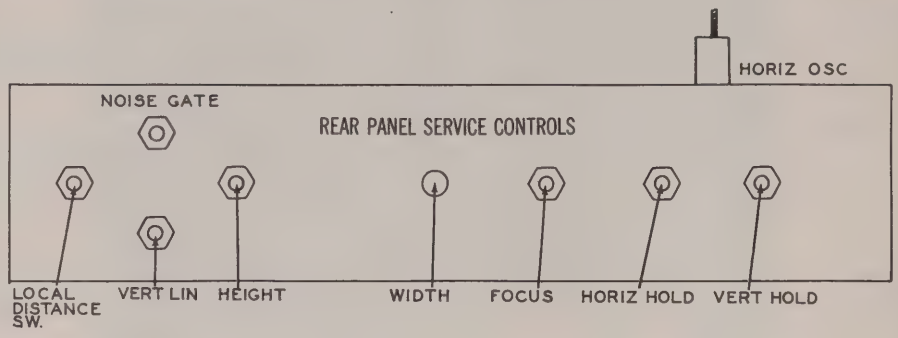
PICTURE TUBE SAFETY GLASS CLEANING

For picture tube Safety Class cleaning, it is necessary to remove chassis. (See disassembly instructions.)

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions.)

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the Horiz. Oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the Horiz. Hold Control at the center of its range and adjust the Horiz. Osc. slug L29 until, picture synchronizes horizontally. (For location see tube placement chart.)

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate Sound IF Detector Buzz, adjust the Ratio Detector Secondary L28 located on top of chassis. (See tube placement chart.)

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 4 push on type control knobs from front panel.
2. Remove 4 wood and 1 metal screws. Remove rear cover.
3. Disconnect built in antenna and speaker.
4. Remove 1 wood screw. Remove antenna bracket.
5. Remove 2 wing nuts. Remove speaker.
6. Remove 4 chassis bolts. Lift front part of chassis and remove from cabinet.

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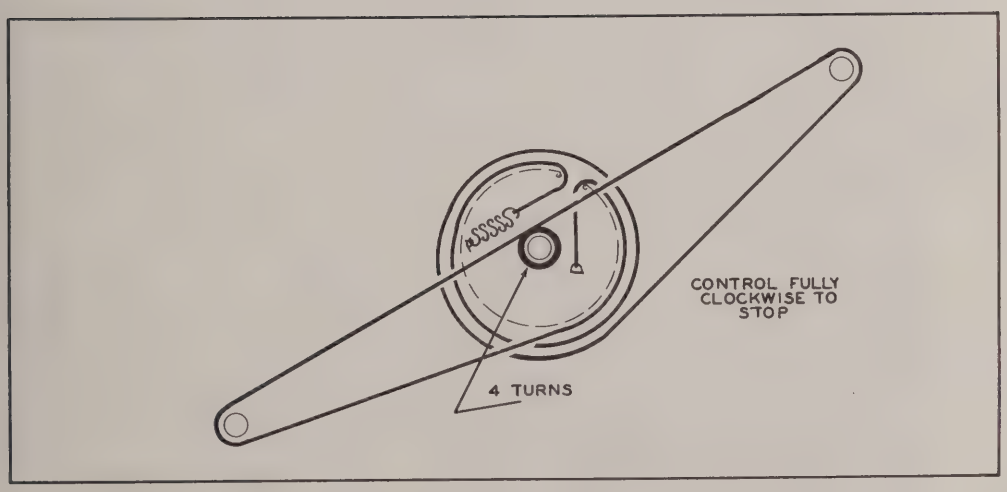
MAPLE ST.
DENVER, COLORADO



UHF DRIVE CORD STRINGING

PROPERTY OF
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3924 MEADE ST.
DENVER, COLORADO

EICOR
MODEL 230

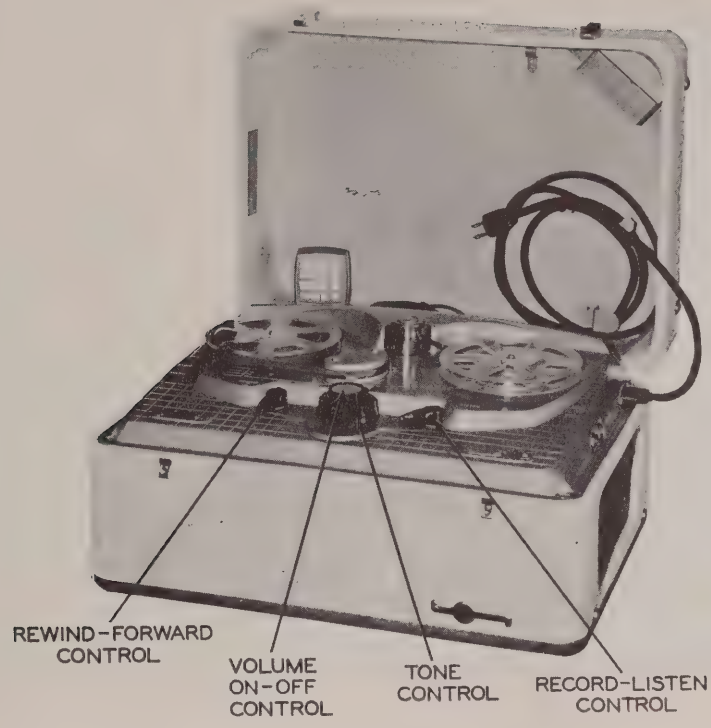

Figure 1

EICOR
MODEL 230

GENERAL INFORMATION

The Eicor Model 230 is designed to record and play back two tracks of material on standard width recording tape, which doubles the playing time with no loss of frequency response or quality. Recordings can be made from a radio, television receiver or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speaker, external speaker or through a high fidelity amplifier system.

This Eicor is equipped with a dual speed capstan. When the capstan sleeve is in position over the capstan, the tape speed is 7.5 inches per second and with the sleeve removed, a tape speed of 3.75 inches per second will be obtained.

Using both channels of the tape, the recording time is as follows:

SIZE	SPEED 3 3/4	SPEED 7 1/2
5" reel	1 hour	1/2 hour
7" reel	2 hours	1 hour

Connect this recorder only to an outlet supplying 117 volts, 60-cycle, AC supply.

Manufactured by:

Eicor, Inc.
1501 West Congress Street
Chicago, Illinois

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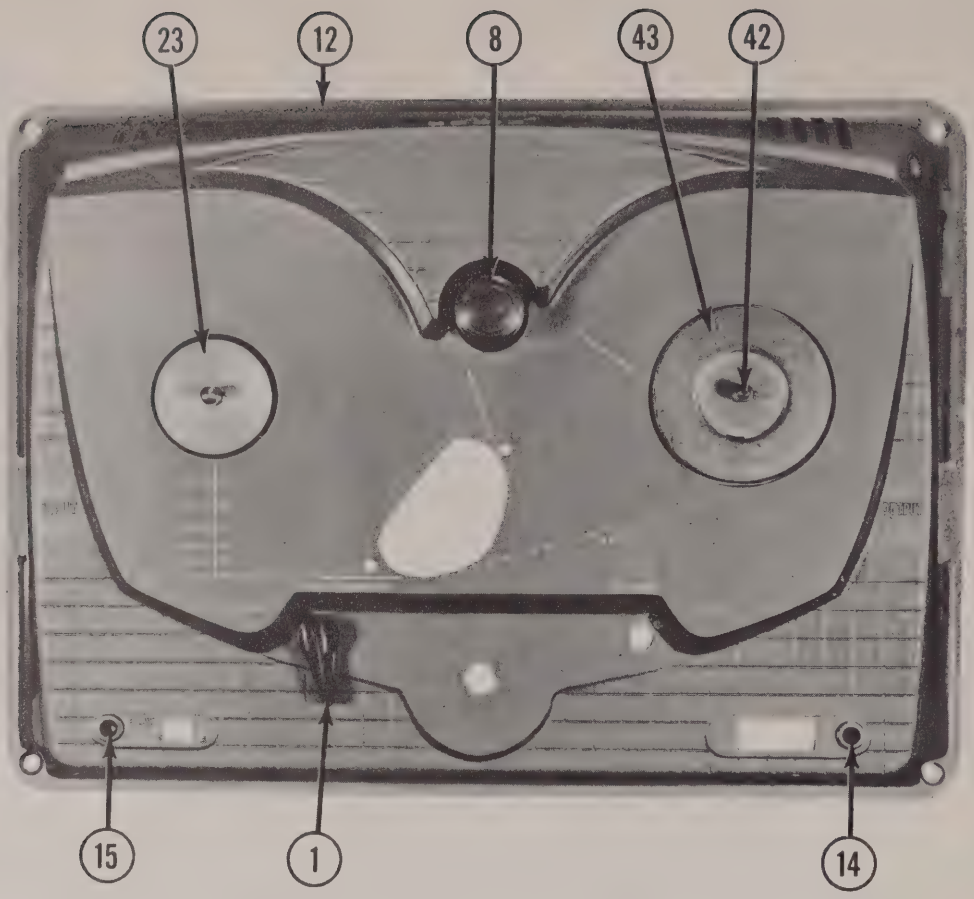

Figure 2

OPERATING CONTROLS

To Start-

Turn volume control knob (9) clockwise.

Volume-

Degree of rotation of volume control knob (9) determines volume of recording and play back.

Tone-

Tone control knob (10) controls tone and operates only for play back.

Tape Travel-

Rewing-Stop-Forward control knob (1) controls direction of tape travel. Always return this knob to "Stop" position before turning unit off.

Record-Listen-

Record-Listed control knob (11) controls amplifier and record playback head. To prevent accidental erasure, place in "Listen" position immediately after recording is completed.

OPERATING INSTRUCTIONS

1. Insert the AC power cord into the receptacle on the right side of the top plate.

2. Plug the AC cord into a convenient wall receptacle of the proper rating.

Threading The Tape-

1. Place a reel of tape (either 5" or 7") on the left spindle (23) and an empty reel on the right spindle (43) making sure the reel slots engage the reel pin on the spindles.

2. Thread the tape by following the solid printed line on the top panel (Fig. 1).

NOTE: This recorder uses Type "A" wound tape, i.e. the dull magnetic coated side faces inward on the reel. If the tape used is Type "B" (coated side facing outward) the recording will be made at a very low sound level and the playback will be almost inaudible.

3. Insert the free end of the tape through to the hub of the right reel and place a pencil firmly over the tape, forcing it into one of the three radial slots. Turn the reel several turns (counterclockwise) with the pencil in this position until the tape is secured to the reel and all slack is taken up between reels.

Setting Tape Speed-

The Eicor is equipped with a quick change dual speed capstan. When the capstan sleeve (8) is in

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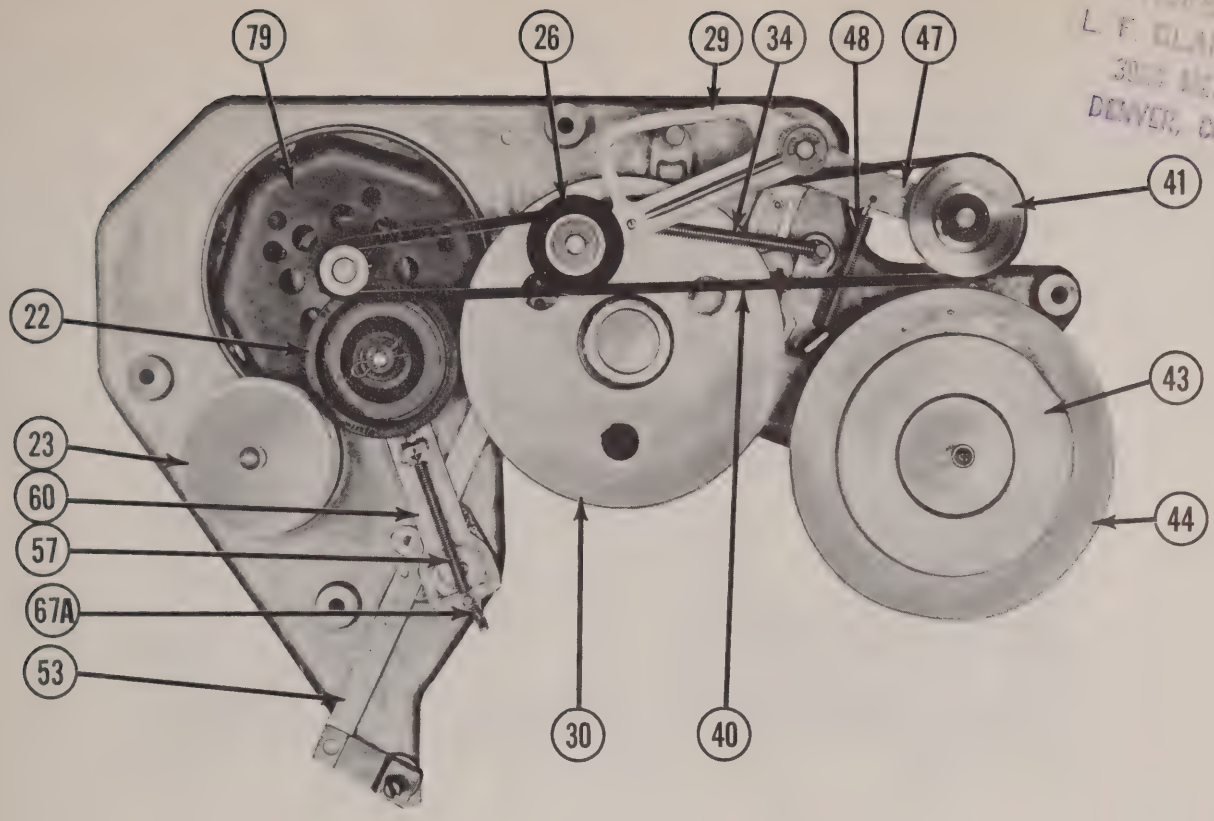

Figure 3

position over the capstan, the tape speed will be 7.5 inches per second and with the sleeve removed, a tape speed of 3.75 inches per second will be obtained.

Because the tone fidelity will vary with the speed of the tape, a compensating circuit activated by the slide switch located next to the green indicator light has been provided. For operation with the capstan sleeve in position, the switch button should be in a full left position and when operating with the sleeve removed, the switch button should be placed in a full right position.

NOTE: For recording speech, the slower speed is excellent and allows the maximum recording and playing time. For higher quality recording as is desired for music reproduction, the faster speed is best.

To Record From Microphone-

1. Turn the volume control knob (9) to the right until a click is heard and allow about thirty seconds for the amplifier to warm up.

2. Insert microphone plug into input socket labeled "Micro".

3. Turn record-listen knob (11) to "Record" position. When in record position the red light on the right side of the top plate will come on.

4. While talking into the microphone, adjust the volume control until the neon indicator light flashes slightly.

NOTE: Correct recording volume is very important. Too weak a signal, which does not cause the neon indicator to flash, will result in weak playback and high background noise. Too strong a signal, causing the indicator to flash constantly, will result in distortion during playback.

To Record From Radio-

Recordings can be made from a radio by placing the microphone near the loudspeaker of the radio; however, this type of recording may not be satisfactory as other sounds may be picked up by the microphone which as a result will be recorded on the tape. A superior quality recording can be made by use of the radio-phono attachment cord which is supplied with the recorder. Connect attachment cord as follows:

1. Connect the cord clips across the voice coil terminals on the radio speaker.

2. Insert the attachment cord plug into the socket labeled "Radio".

3. Proceed as described in "To Record From Microphone".

NOTE: Remove attachment cord after recording is completed.

To Record From Phonograph-

1. Connect the cord clips of the attachment cord to the pickup leads on the phonograph.

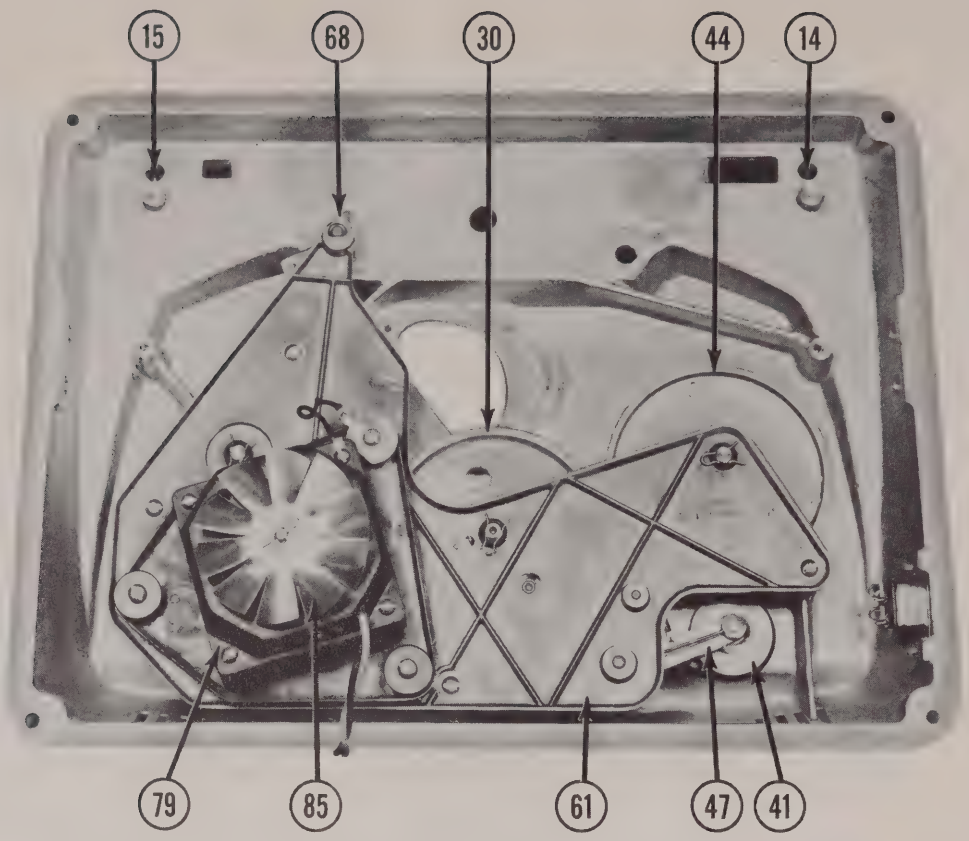

Figure 4

2. Insert the attachment cord plug into the socket labeled "Radio".

3. Proceed as described in "To Record From Microphone".

NOTE: Should a hum develop from the above connection, reverse the cord clips on the pickup leads.

To Record From Television Receiver-

1. Connect attachment cord as described in "To Record From Radio" and proceed with recording as described in "To Record From Microphone".

NOTE: The Eicor Tone Control does not operate during recording. When recording from a radio or television receiver, set the radio or television tone control for maximum treble.

Dual Track Recording-

The Eicor is designed so that only 1/2 the tape width is recorded at a time; thereby resulting in two track recording. This two track operation is accomplished in the following manner:

1. After a reel of tape has been recorded; i.e. all the tape wound on the right reel, place the rewind-stop-forward control knob (1) in the "Stop" position. This stops all movement of the tape.

2. Remove the reels from the recorder, turning the full reel over and placing it on the left spindle.

3. Properly thread the tape and proceed with the recording.

4. After the second track has been recorded the first track of recording is ready to be played, without rewinding, by reversing the reels as described in step No. 2 above.

To Rewind-

1. With the volume control knob (9) turned on, turn the record-listen control knob (11) to "Listen".

2. Turn the rewind-forward control knob (1) to "Rewind" position. As the tape is rewinding, you will hear your recording played backwards at a high rate of speed. When this sound stops, you have come to the start of your recording. To rewind a full reel of tape, remove the tape from between the pressure roller (26) and capstan so the tape will rewind directly across the recorder to the left-hand reel; it will just touch the bottom of the recording head. This method is faster when rewinding an entire reel and reduces recording head wear.

DENVER, COLORADO

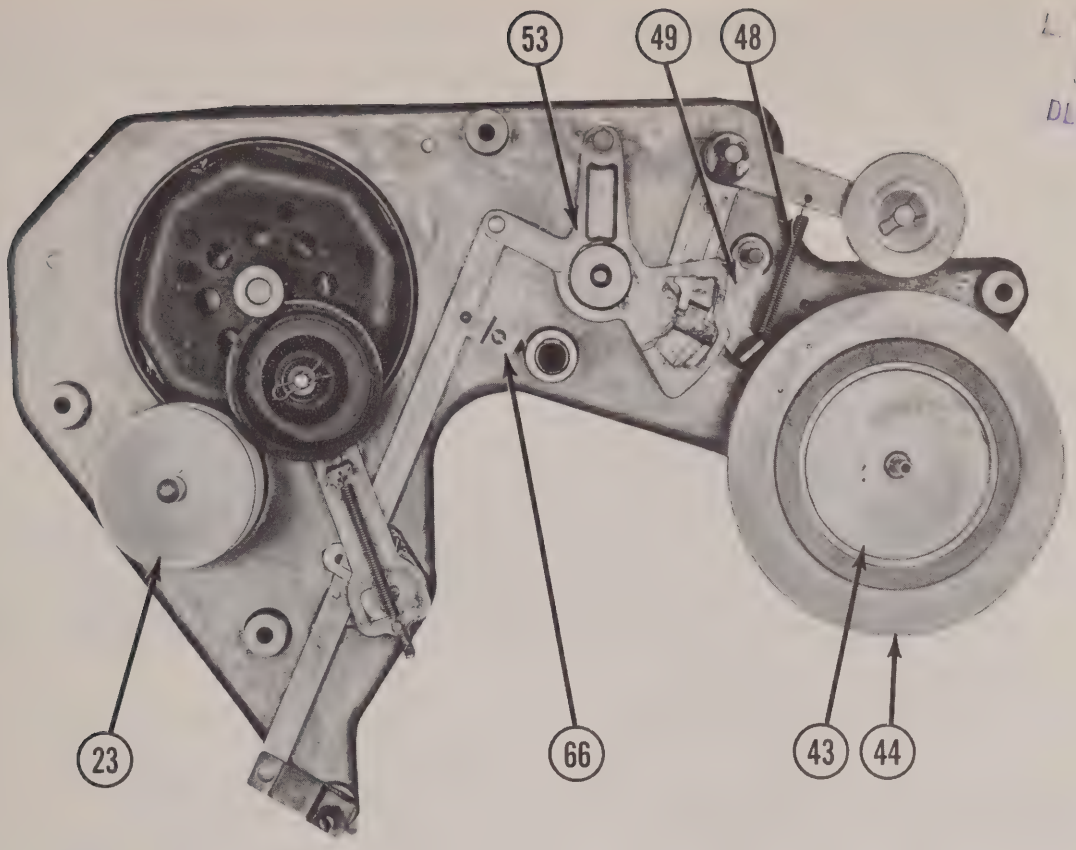

Figure 5

To Play a Recording-

1. Thread the tape as described under "Threading the Tape".

2. Turn the On-Off Volume control knob (9) on and allow approximately thirty seconds for the tubes to warm up.

3. Place the record-listen control knob (11) in the "Listen" position.

4. Place the rewind-stop-forward control knob (1) in the "Forward" position and adjust the Volume and Tone control to the desired level.

To Use an External Speaker-

Any size speaker of the permanent magnet type, having a 3.2 Ω voice coil, may be used by connecting the attachment cord across the voice coil terminals of the speaker and then inserting the plug of the attachment cord into the socket labeled "3.2 Ω Speak".

To Edit and Splice Tape-

NOTE: Since it is impossible to edit and splice one track without affecting the other, recordings which are to be edited should be limited to one track only.

1. The tape may be edited by cutting out unwanted portions, or by joining selections into another sequence. Announcements may be inserted between selections, etc. Unused sections of tape can be spliced together for re-use.

2. For best results, cut tape at a slight diagonal, join ends together with splicing tape on the glossy side and trim off any excessive width.

Erasing Recorded Material-

It is not necessary to first erase a recorded tape if the same tape is to be used for a new recording. Erasing of recorded material takes place automatically when new material is recorded. If it is desired only to erase a tape, set the machine for recording without having the microphone or attachment cord connected to input jacks.

DISASSEMBLY INSTRUCTIONS

To remove the recorder from its cabinet, disconnect the line cord and remove the four No. 10 Phillips head wood screws (13) at the corners of the top panel (12). Insert a thin-blade screwdriver between the panel and the cabinet and pry upwards enough to slip the fingers under the panel. Lift up enough to permit the speaker plug to be disconnected from the amplifier. The recorder can now be removed complete.

In handling the recorder out of its cabinet, care must be taken to avoid damage to the motor fan (85)

and the motor shaft. When replacing the recorder, check to be sure the speaker leads and the motor leads will not be pinched or will not interfere with the recorder mechanism.

MECHANICAL DRIVE ASSEMBLY

1. With the rewind-forward control knob (1) in the "Stop" position, idler wheel (22) should be in a neutral position; that is, there should be a clearance of 1/32" between the motor shaft and the idler wheel.

2. With control knob (1) in the "Rewind" position, idler wheel (22) is pivoted against the rewind drum (23) and the motor shaft. This accounts for the fast rewind speed. Make a check, by turning the rewind drum (23) counterclockwise, to see if these parts contact each other properly. The idler wheel should turn the motor shaft. If this does not occur, check for binding parts, oil on the friction surfaces, or looseness of springs (57 and 67A).

3. When control knob (1) is in the "Forward" position, idler (22) is pivoted against the capstan (30), and the "O" ring belt (40), which is driven by the motor belt pulley (16), is pivoted against the rim of the take-up drum (44).

4. With the motor running and the control knob (1) in the "Stop" position there should be at least 1/32" clearance between belt (40) and take-up drum (44).

5. With the motor running and control knob (1) in the "Stop" position, observe belt (40). The same portion of the belt surface should run in the pulley grooves at all times, that is the belt should not rotate about the center of a cross section. If such rotation does occur, belt pulley (16) is not correctly located.

6. Check end play of the rewind drum (23), capstan drum (30) and take-up drum (44). Each should have some end play, not more than 1/32". Correct assembly of washers on these shafts should control this.

7. With control knob (1) in "Rewind" position, there should be at least 1/32" clearance between the rubber on the brake (49) and the take-up drum (44). With the motor running, move the control knob slowly from "Rewind" to "Stop". Meanwhile, rotate the take-up drum (44) manually. The brake should contact the take-up drum before the rewind drum stops rotating. Bend the brake arm to meet these requirements.

8. Place a full 5" reel of tape on the take-up shaft (43) and run the machine in the "Forward" position. Measure the tension required to hold the tape reel stationary. This tension should be 1 to 2 ounces.

NOTE: This tension should be measured after the machine has been running with the clutch slipping for at least one minute. The tension is controlled by the type and amount of lubricant used on the felt washer.

9. Place a full 5" reel of tape on the rewind drum (23) and measure the tension required to pull tape off the reel. The tension should be 3/8 to 3/4 ounce. The tension is controlled by the type and amount of lubricant used on the felt washer.

10. Check functioning of pressure roller (26) by holding tape disc (43) on take-up drum (44) and letting tape run through capstan. If tape does not run through smoothly, check to see if pressure roller surface is clean and spring tension on arm is adequate. The pressure roller shaft should be well oiled. The pressure roller in contact should be flush up against the capstan.

TROUBLES

Take-Up Drum and Capstan Speed Irregular-

1. Grease or oil on the rubber surface of idler wheel (22), motor shaft, pressure roller (26), "O" belt (40) and take-up drum (44). Clean these parts with naptha.

2. Motor belt pulley (16) loose.

Tape Overruns When Control Is Turned From "Rewind" to "Stop" Position-

1. Brake assembly (49) not adjusted properly. (See "Mechanical Drive Assembly" #7).

Tape Will Not Rewind-

1. Springs (57 and 67A) loose.

Tape Will Not Run Forward-

1. Springs (57 and 67A) loose.

LUBRICATION

Extreme care must be taken when lubricating the mechanism. For satisfactory operation, the instructions in this section should be followed.

1. Mechanical linkages should be lubricated lightly at points of friction with Sta-Put No. 18-H.

2. The shafts of rotating parts, when replaced, should be wiped clean with a lint-free cloth or paper and oiled lightly with Kensington No. 9 Spindle Oil. Use two or three drops!

3. When lubricating the felt washers on the take-up and rewind drum, use Sta-Put Oil No. 360. Saturate the felt washers and then remove as much of the oil as possible by pressing a cloth or absorbent paper against them.

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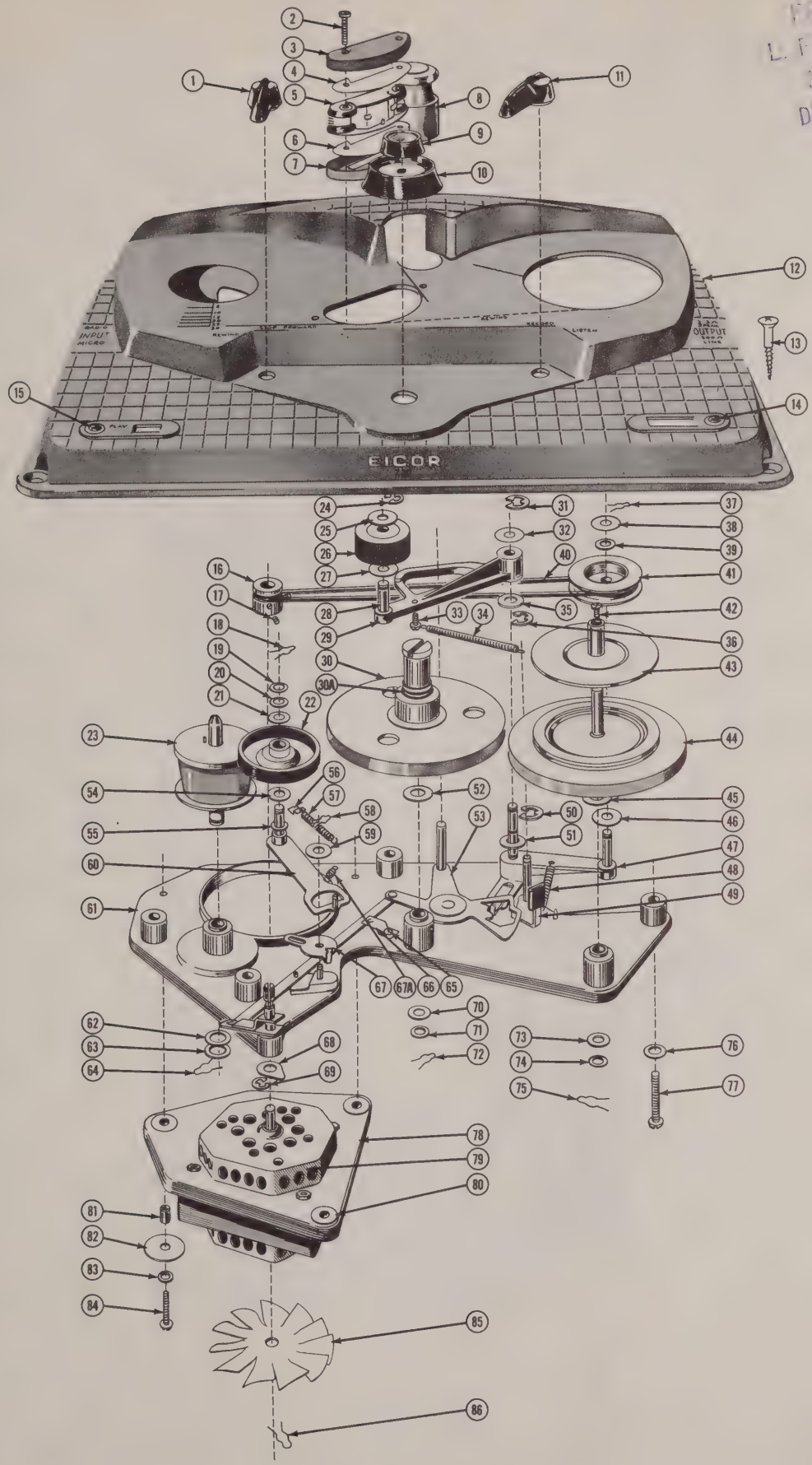

A PHOTOFACT "EXPLODED" VIEW

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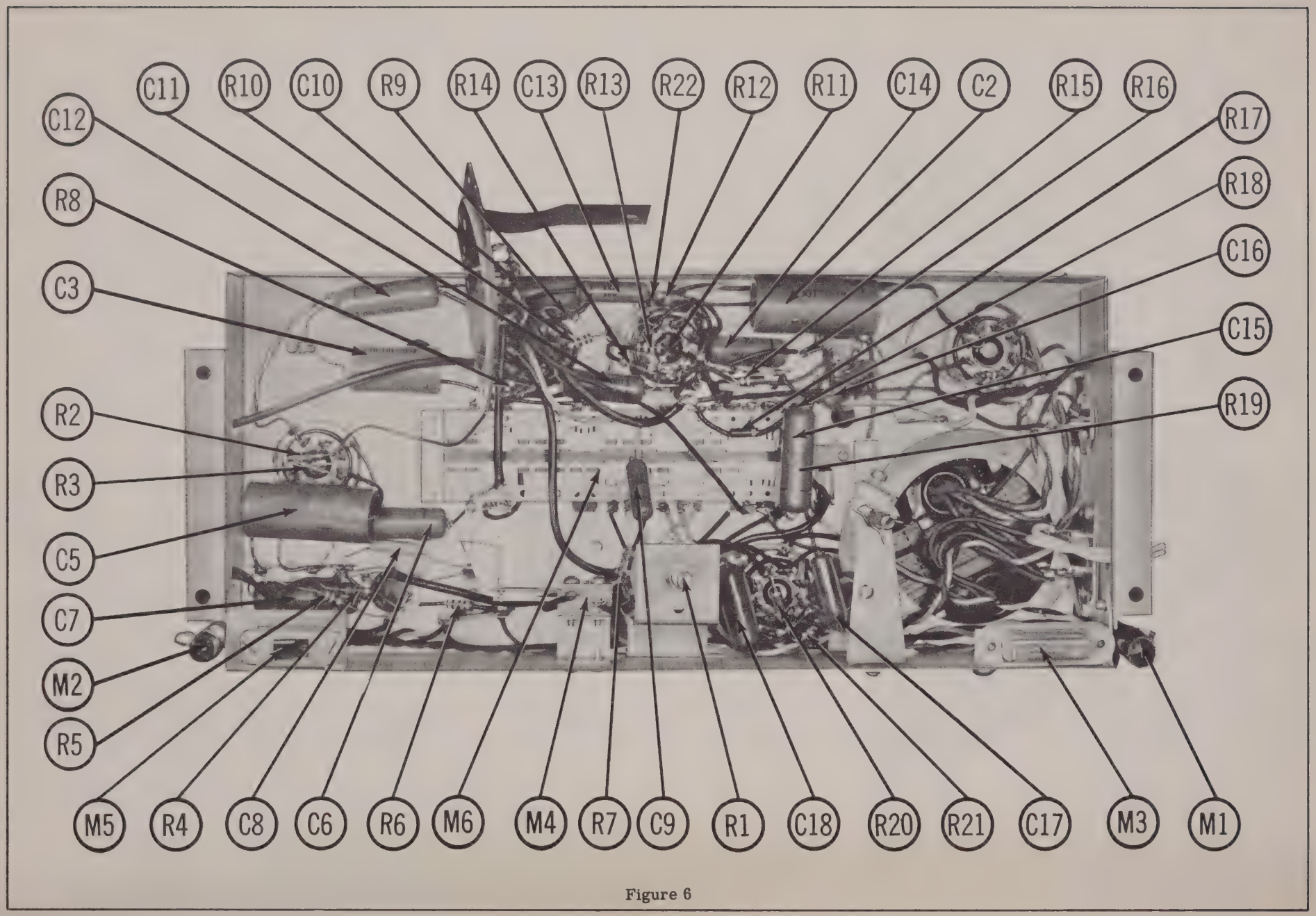
C11
R10
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C7
M2
R5
M5
R4
C8
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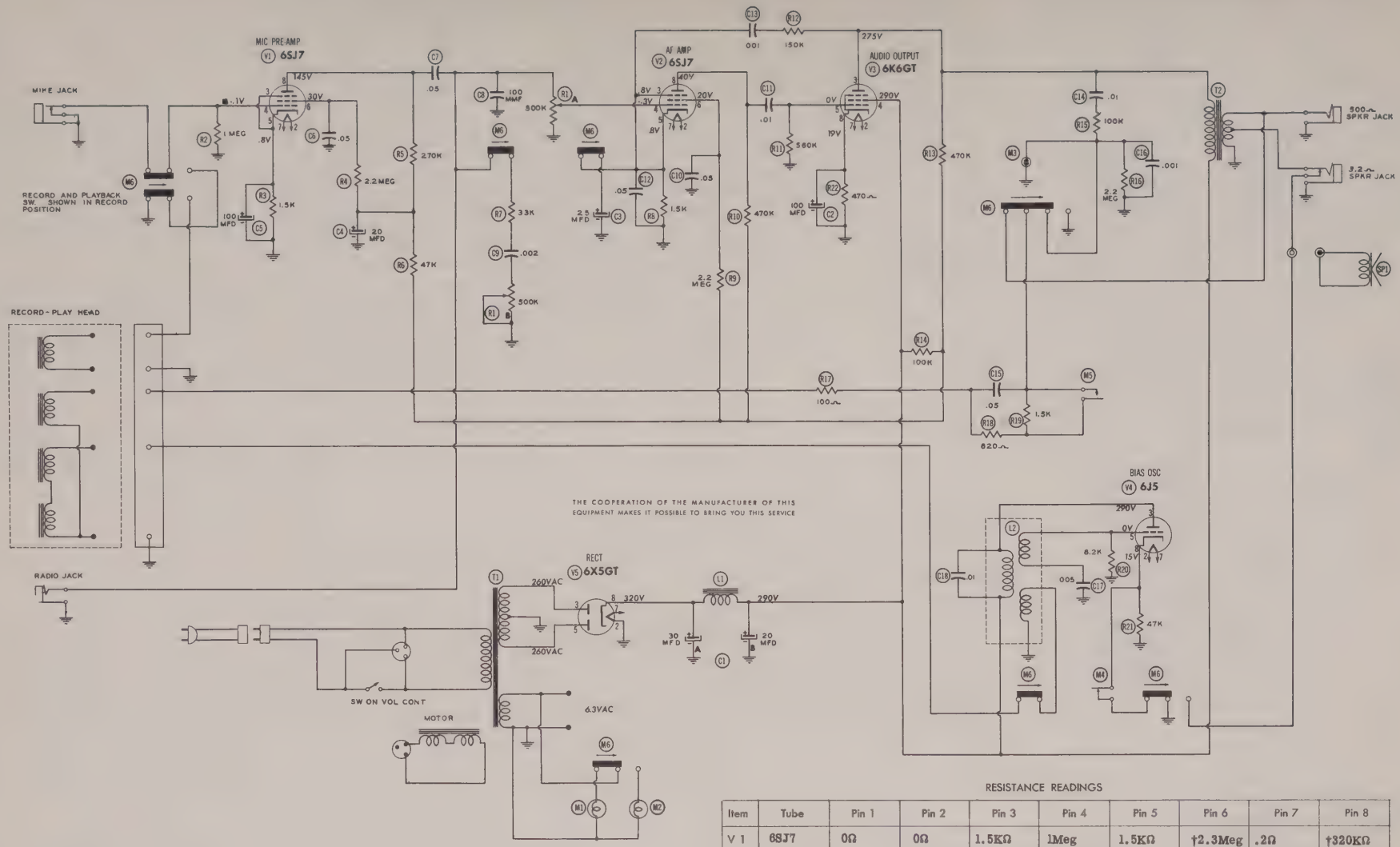
M6
M4
R7
C9
R1
C18
R20
R21
C17
M3
M1

Figure 6



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SJ7	0Ω	0Ω	1.5KΩ	1Meg	1.5KΩ	†2.3Meg	.2Ω	†320KΩ
V 2	6SJ7	0Ω	0Ω	1.5KΩ	500KΩ	1.5KΩ	†2.3Meg	.2Ω	†570KΩ
V 3	6K6	0Ω	0Ω	†1KΩ	†450Ω	560KΩ	INF	.2Ω	470Ω
V 4	6J5	0Ω	0Ω	†450Ω	†450Ω	8.2KΩ	8.2KΩ	.2Ω	47KΩ
V 5	6X5GT	0Ω	0Ω	220Ω	INF	200Ω	INF	.2Ω	1Meg

ALL READINGS IN PLAY BACK POSITION EXCEPT AS DESIGNATED
■ READINGS TAKEN IN RECORD POSITION
† MEASURED FROM PIN 8 OF V5.

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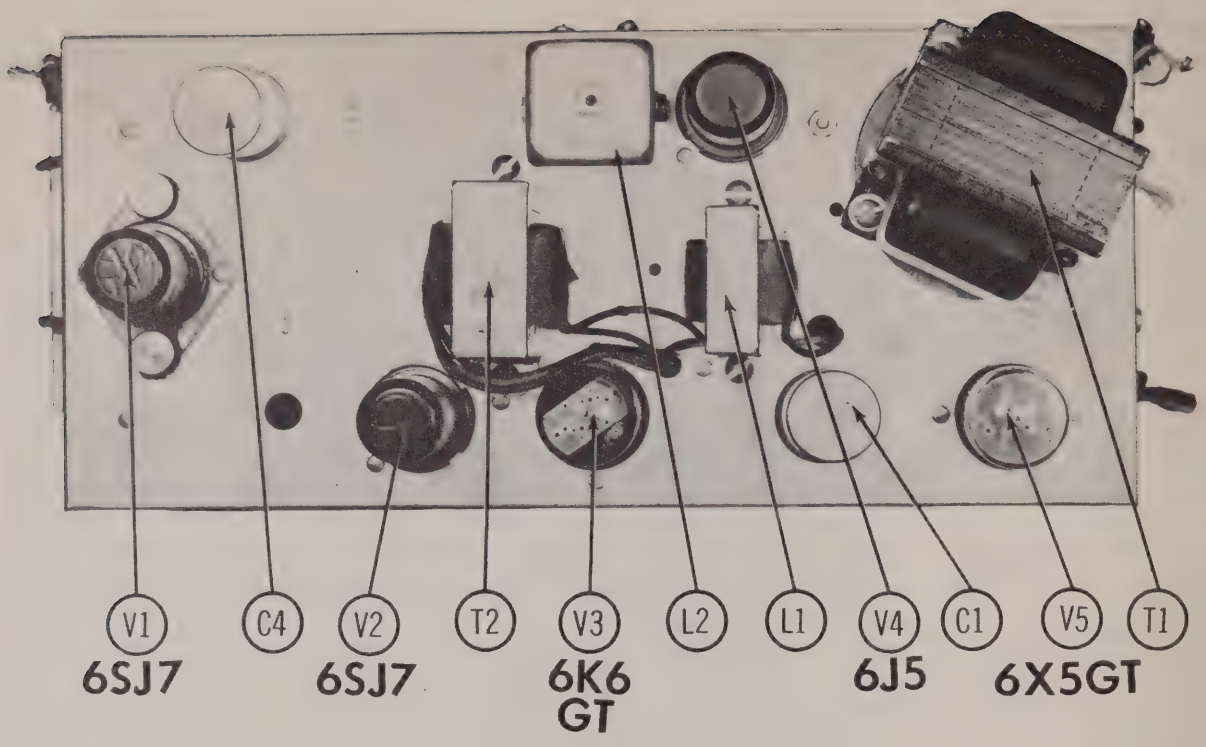

Figure 7

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	TR-101-4119	Rewind-Stop-Forward Control Knob	31	TR-301-2170	"C" Washer
			32	TR-301-2184	Bakelite Washer
2	TR-101-7031	Phillips Round Head Screw,6-32	33	TR-301-2180	No. 6 Self Tapping Screw
3	TR-101-1016A	Upper Head Shield	34	TR-101-4092	Pressure Roller Arm Spring
4	TR-101-1027	.010" Shield	35	TR-301-2184	Bakelite Washer
5	TR-301-1062	Head Assembly (cartridge only)	36	TR-301-2170	"C" Washer
6	TR-101-1027	.010" Shield	37	TR-101-2072	Spring Retainer
7	TR-301-1065A	Lower Head Shield	38	TR-301-2184	Bakelite Washer
8	TR-301-2199	Capstan Head & Button Assy.	39	TR-101-2012	Felt Washer
9	TR-301-4280	Volume Control Knob	40	TR-101-2002	"O" Ring Belt
10	TR-301-4195A	Tone Control Knob	41	TR-101-2081	Belt Pulley & Bushing Assy.
11	TR-101-4119	Record-Listen Control Knob	42	TR-101-7005	Binder Head Machine Screw, 4-40 x 3/16
12	TR-301-4196A	Top Plate			
13	TR-101-7010	Phillips Head Wood Screw, 10 x 1 1/4	43	TR-101-2079	Tape Disc Assembly
			44	TR-301-2194	Take-Up Drum Assembly
14	TR-301-4202	Indicator Plug Button (red)	45	TR-301-2185	Bakelite Washer
15	TR-301-4201	Indicator Plug Button (green)	46	TR-301-2184	Bakelite Washer
16	TR-101-2033	Motor Belt Pulley	47	TR-101-2080	Belt Pulley Lever & Bushing Assembly
17	TR-101-7004	Allen Set Screw, 6-32			
18	TR-101-2073	Spring Retainer	48	TR-101-2101	Brake Drive Spring
19	TR-101-2044	Bakelite Washer	49	TR-101-2094	Brake Assembly
20	TR-101-2030	Felt Washer	50	TR-301-2170	"C" Washer
21	TR-101-2065	Fishpaper Washer	51	TR-101-2012	Felt Washer
22	TR-101-2003	Idler Wheel	52	TR-301-2185	Bakelite Washer
23	TR-301-2195	Rewind Drum Assembly	53	TR-301-2168	Control Link Assembly
24	TR-301-2170	"C" Washer	54	TR-101-2065	Fishpaper Washer
25	TR-301-2184	Bakelite Washer	55	TR-101-2044	Bakelite Washer
26	TR-301-2167A	Pressure Roller Assembly	56	TR-101-2042	Idler Lever Spring Clip
27	TR-301-2184	Bakelite Washer	57	TR-101-2038	Idler Lever Spring
28	TR-301-2179	Pressure Roller Shaft	58	TR-101-2071	Spring Retainer
29	TR-301-2177A	Pressure Roller Arm	59	TR-101-2031	Retaining Washer
30	TR-301-2163	Capstan Drum Assembly	60	TR-101-2089	Idler Lever & Pin Assembly
30A	TR-301-2173	#9 "O" Ring	61	TR-301-2182	Base & Bushing Assembly

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MECHANICAL PARTS LIST (Con't).

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
62	TR-101-2070	Felt Washer	77	TR-301-4214	Round Head Machine Screw, 10-32 x 5/16
63	TR-301-2185	Bakelite Washer			
64	TR-101-2073	Spring Retainer	78	TR-101-2086	Motor Mounting Plate (for Alliance motor)
65	TR-301-3184	Self Tapping Screw, No. 4			
66	TR-301-2189	Control Link Stop		TR-101-2134	Motor Mounting Plate (for Fasco motor)
67	TR-101-2043	Idler Cam			
68	TR-301-2157	Control Switch Arm	79	TR-101-1000	Motor (Alliance)
69	TR-301-2174	"C" Washer		TR-101-2136	Motor (Fasco)
70	TR-101-2070	Felt Washer	80	TR-101-2001	Grommet
71	TR-301-2185	Bakelite Washer	81	TR-101-2006	Bushing
72	TR-101-2073	Spring Retainer	82	TR-101-2150	Washer
73	TR-101-2070	Felt Washer	83	TR-301-7002	Split Lockwasher, No. 10
74	TR-301-2185	Bakelite Washer	84	TR-101-7003	Round Head Machine Screw
75	TR-101-2073	Spring Retainer	85	TR-101-2095	Fan
76	TR-301-4216	Washer, No. 10	86	TR-101-2073	Spring Retainer

ELECTRICAL PARTS LIST

Ref. No.	Description	Ref. No.	Description
V1	6SJ7, Mic. Pre-Amp.	R5	Resistor, 270KΩ, 1/2 Watt
V2	6SJ7, AF Amp.	R6	Resistor, 47KΩ, 1/2 Watt
V3	6K6GT, Power Output	R7	Resistor, 33KΩ, 1/2 Watt
V4	6J5, Bias Oscillator	R8	Resistor, 1500Ω, 1/2 Watt
V5	6X5GT, Rectifier	R9	Resistor, 2.2 Meg., 1/2 Watt
C1A	Electrolytic Cap., 30mfd. @ 350V.	R10	Resistor, 470KΩ, 1/2 Watt
C1B	Electrolytic Cap., 20mfd. @ 350V.	R11	Resistor, 560KΩ, 1/2 Watt
C2	Electrolytic Cap., 100mfd. @ 25V.	R12	Resistor, 150KΩ, 1/2 Watt
C3	Electrolytic Cap., 25mfd. @ 25V.	R13	Resistor, 470KΩ, 1/2 Watt
C4	Electrolytic Cap., 20mfd. @ 350V.	R14	Resistor, 100KΩ, 1/2 Watt
C5	Electrolytic Cap., 100mfd. @ 25V.	R15	Resistor, 100KΩ, 1/2 Watt
C6	Capacitor, .05mfd. @ 400V.	R16	Resistor, 2.2 Meg., 1/2 Watt
C7	Capacitor, .05mfd. @ 400V.	R17	Resistor, 100Ω, 1/2 Watt
C8	Capacitor, 100mmf., Mica	R18	Resistor, 820Ω, 1 Watt
C9	Capacitor, .002mfd. @ 200V.	R19	Resistor, 1500Ω, 1 Watt
C10	Capacitor, .05mfd. @ 400V.	R20	Resistor, 8200Ω, 1/2 Watt
C11	Capacitor, .01mfd. @ 600V.	R21	Resistor, 47KΩ, 1/2 Watt
C12	Capacitor, .05mfd. @ 400V.	R22	Resistor, 470Ω, 1 Watt
C13	Capacitor, .001mfd. @ 600V.	T1	Power Transformer
C14	Capacitor, .01mfd. @ 600V.	T2	Output Transformer
C15	Capacitor, .05mfd. @ 400V.	L1	Filter Choke
C16	Capacitor, .001mfd. @ 600V.	L2	Bias Osc. Coil
C17	Capacitor, .005mfd. @ 600V.	SP1	5" x 7" Oval Speaker, PM (3.2Ω)
C18	Capacitor, .01mfd. @ 600V.	M1	Pilot Light, Type #47 (Record Indicator)
R1A	Volume Control & Switch, 500KΩ (Rear Section)	M2	Pilot Light, Type #47 (Play Indicator)
R1B	Tone Control, 500KΩ	M3	Neon Lamp (Record Level Indicator)
R2	Resistor, 1 Meg., 1/2 Watt	M4	Switch, Erase Interlock
R3	Resistor, 1500Ω, 1/2 Watt	M5	Speed Equalization Switch
R4	Resistor, 2.2 Meg., 1/2 Watt	M6	Play-Record Switch

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FIRESTONE
MODEL 4-B-72

FIRESTONE
MODEL 4-B-72

TRADE NAME	Firestone Model 4-B-72 (Code #120-3-6M333) (For 1953 Chevrolet Automobiles)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio
TYPE SET	Battery Operated Custom-built Automobile Superheterodyne Receiver
TUBES (Six)	Types 6BA6 RF Amp., 6BE6 Conv., 6BA6 IF Amp., 6AT6 (or) 6AV6 Det.-AVC-AF Amp., 6V6GT Audio Output, 6X5GT Rectifier
POWER SUPPLY	6 Volt Storage Battery — RATING 5.3 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	538-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	68MMF	High side to antenna terminal. Low side to chassis.	1600KC	"	"	A5	"
3.	"	"	1400KC	Tune to 1400KC signal	"	A6, A7	"
4.	"	"	600KC	Tune to 600KC signal	"	A8, A9	"
5.	Repeat step 3.						

With tuning gang fully closed set pointer to left edge of "55" on the dial.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		FIRESTONE PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amplifier	6BA6	6BA6	7BK	
V4A	Det.-AVC-AF Amp.	6AT6	6AT6	7BT	
B	Det.-AVC-AF Amp.	6AV6	6AV6	7BT	
V5	Audio Output	6V6GT	6V6GT	7S	
V6	Rectifier	6X5GT	6X5GT	6S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	■20	350	CE-86	AFH3-109		CO80		FP345.8	TVL-3678	
B	▲20	350								
C	20	25								
C2	.05	200	C503-2	P488-05	DF-503	PTE4S5		PT415	4TM-S5	
C3	.05	200	C503-2	P488-05	DF-503	PTE4S5		PT415	4TM-S5	
C4	.05	200	C503-2	P488-05	DF-503	PTE4S5		PT415	4TM-S5	
C5	100		CC101	S1100	D6-101	TM5T1	GPIK-101	UC-531	5GA-T1	
C6A	220		*PC-151	*PA-113-2	*PC-151		*1408-02		*103C5	
B	5000									
C										
D	5000									
E										
C7	.01	600	CC101	P688-01	DD-1032	PTE6S1	GP2-333-103	PT611	6TM-S1	
C8	.005	200	C502-6	P688-005	D6-502	PTE6D5		PT625	6TM-D5	
C9	.008	1600	C802-16	VBC-26		PTE16D8		PT1628	MB-D8	
C10	.5	100	CC504-1	VHC-36		MP2P5		RF480	2TM-P5	
C11	.5	100	CC504-1	VHC-36		MP2P5		RF480	2TM-P5	

* C6A, C6B, C6C, C6D, C6E and R8A, R8B, R8C are combined in one unit. When replacing items separately C6E and C6C must total 250MMF.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	FIRESTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	750KΩ	½	RV-57	Q13-137	AG-79-Z	B-70-S	U-51	Volume-Note
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	US-26	Attach to R1A

Note: Some Models may use an alternate control (part #RV-333)

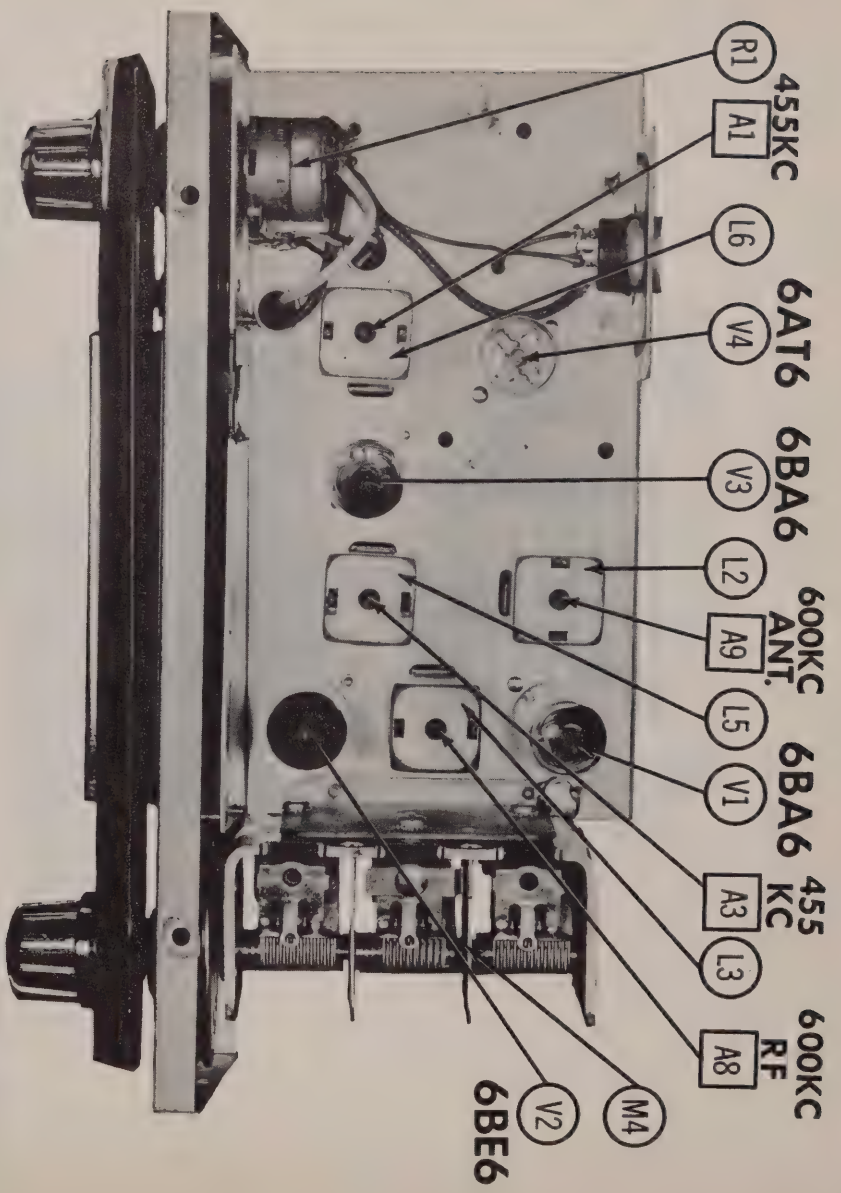
RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	FIRESTONE PART No.	IRC PART No.	
R2	1.2Meg	½	R125	BTS-1.2Meg	
R3	330Ω	½	R331	BTS-330	
R4	22KΩ	½	R223	BTS-22K	
R5	1500Ω	½	R152	BTS-1500	
R6	22KΩ	2	R223-2	BTB-22K	
R7	2.2Meg	½	R225	BTS-2.2Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	FIRESTONE PART No.	IRC PART No.	
R8A	6.8Meg	½	*PC-151	BTS-6.8Meg	
B	470KΩ	½		BTS-470K	
C	470KΩ	½		BTS-470K	
R9	470KΩ	½	R474	BTS-470K	
R10	330Ω	½	R331	BTS-330	
R11	1000Ω	1	R102-1	BTA-1000	
R12	100Ω	½	R101	BTS-100	Note
R13	100Ω	½	R101	BTS-100	Note

* Items R8A, R8B, R8C, C6A, C6B, C6C, C6D, C6E are combined in one unit.
Note 1. Some Models may use a 82Ω resistor in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (VIBRATOR)

ITEM No.	RATING				REPLACEMENT DATA				
	PRI.	SEC. 1	SEC. 2	SEC. 3	FIRESTONE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
T1	6.3VAC @2A	430VCT .046ADC			TV-100		P-2971	VT-1 ①	V-16K

① Drill one new mounting hole.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		FIRESTONE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T2	5KΩ	3.2Ω	370Ω	.54Ω	Part of Spkr.	A-3877	A-2930	RO-9 ①	S-3X	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	FIRESTONE PART No.	JENSEN PART No.	QUAM PART No.	
SP1	6 x 9"	PM	3.2Ω	PM-900	ST-810 Mod. P69-V	69A3	

COILS (RF-IF)

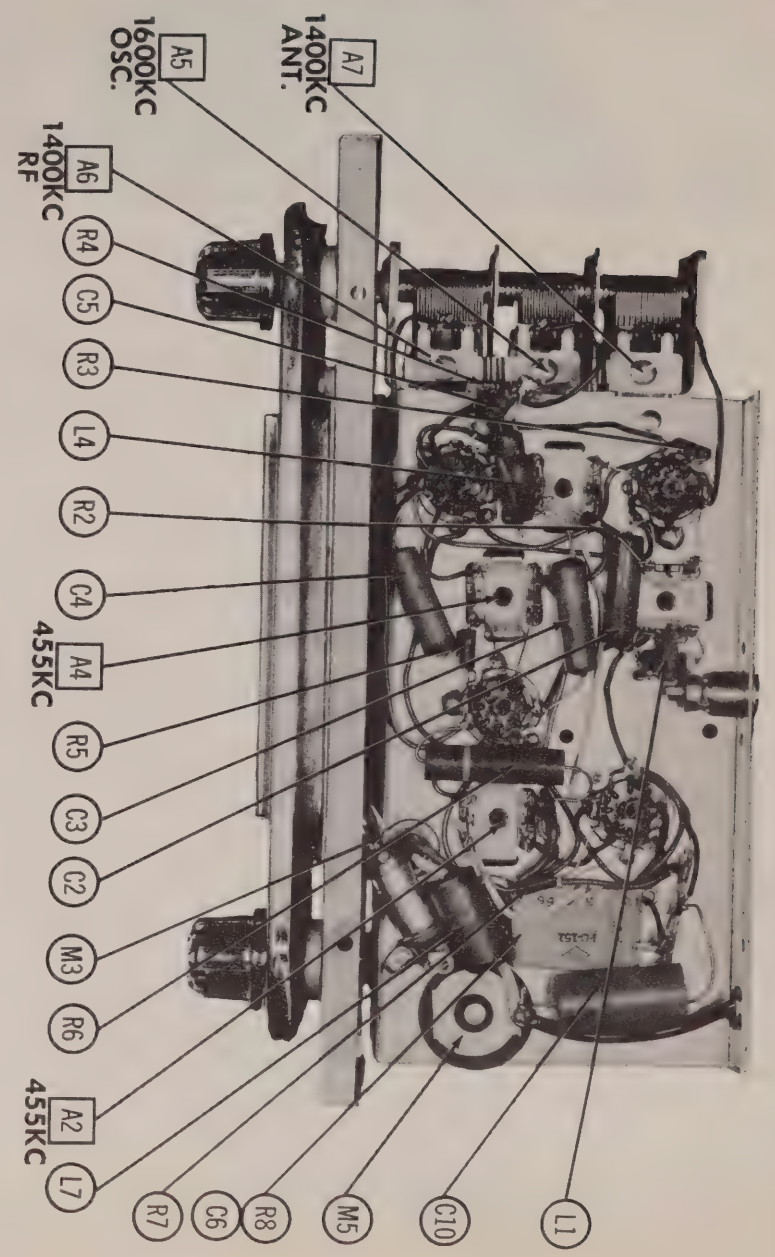
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. RF Choke	1.1Ω		L200			4624 *	14 Microhenries, wound on 10MMF capacitors.
L2	Ant. Coil	14Ω	4.6Ω	57FB-3				
L3	RF Coil	95Ω	6Ω	57FB-4				
L4	Osc. Coil	9Ω		L201				
L5	Input IF	19Ω	19Ω	1655-16	16-6758	BC-352	71-Osc.†	Tapped @ .7Ω
L6	Output IF	19Ω	19Ω	1655-16	16-6758	BC-353	12-C1	
L7	Fil. Choke	0Ω		L203			12-C2	
L8	Vibrator Hash Choke	0Ω		L202			5221	15 Microhenries 21 Microhenries

* Connect in series with 10MMF Capacitor.
† Drill mounting hole.

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				FIRESTONE PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	6.3V	115~	V-83	5301	859	5301	

CHASSIS—BOTTOM VIEW



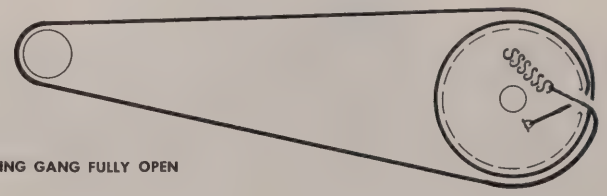
PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			FIRESTONE PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	SFE	14A	A200		307014 (14A-SFE)	155014	SFE14	HD1

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M3	Dial Light	T-47	Type #47
M4	Tuning Cap.	CV-100A	(23-391MMF, 24-387MMF, 35-198MMF)
M5	Spark Plate		
M6	Switch		Bass-treble
	Knob	H310E	Volume & Tuning (2 Used)
	Dial Scale	D333	
	"A" Lead Assy.	FH226	Includes fuse holder



TUNING GANG FULLY OPEN

DIAL CORD DRIVE

Y OF
KENSHIP
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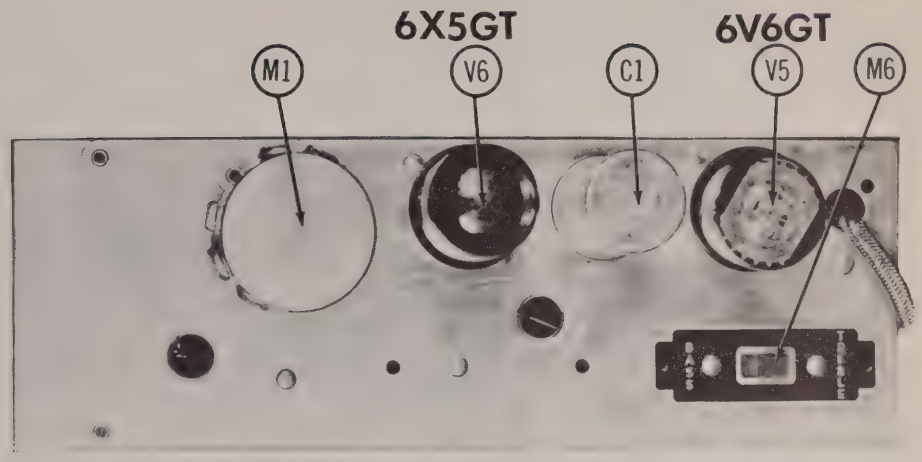
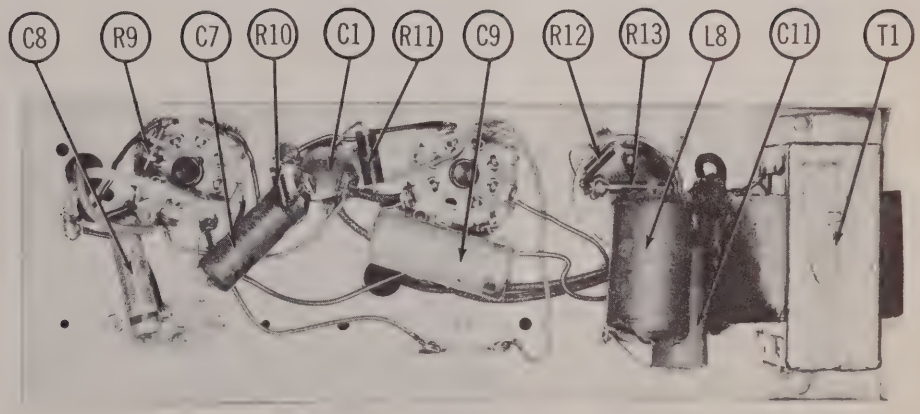
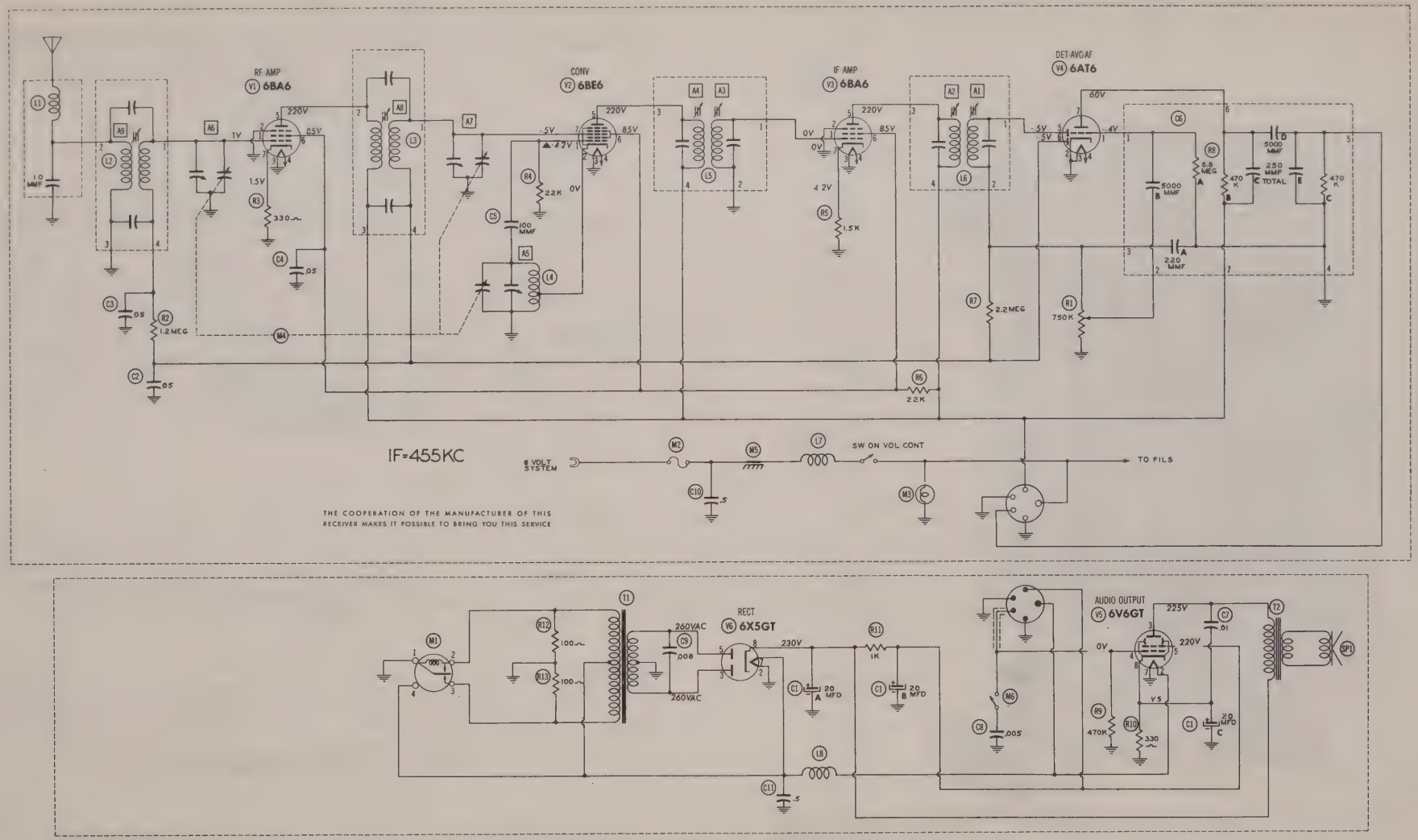
DENVER, COLORADO







RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6BA6	4.2Meg	0Ω	0Ω	.1Ω	†1KΩ	†23KΩ	330Ω	
V 2	6BE6	22KΩ	.7Ω	0Ω	.1Ω	†1KΩ	†23KΩ	3Meg	
V 3	6BA6	18Ω	0Ω	0Ω	.1Ω	†1KΩ	†23KΩ	1.5KΩ	
V 4	6AT6	6.8Meg	0Ω	0Ω	.1Ω	750KΩ	3Meg	†470KΩ	
V 5	6V6GT	INF	.1Ω	†370Ω	†1KΩ	240KΩ	INF	0Ω	330Ω
V 6	6X5GT	INF	.1Ω	400Ω	INF	440Ω	INF	0Ω	3Meg

* TAKEN WITH VACUUM TUBE VOLTMETER
† MEASURED FROM PIN 8 OF V6

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223-7

1 - DC Voltage measurements are at 20,000 ohms per volt, AC Voltages measured at 1000 ohms per volt.
2 - Socket connections are shown as bottom views.
3 - Measured values are from socket pin to common negative.
4 - Battery voltage maintained at 6.3 volts for voltage readings.
5 - Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6 - Volume control at maximum, no signal applied for voltage measurements.

PHOTOFACT* Folder

RETMA MEMBER

STEWART-WARNER MODELS 21C-9300E, F, G, K, KB, L, LB, M, MB, P, 21T-9300A, AA, B, D, H, HA, R, RB, S, T (Series A thru T)

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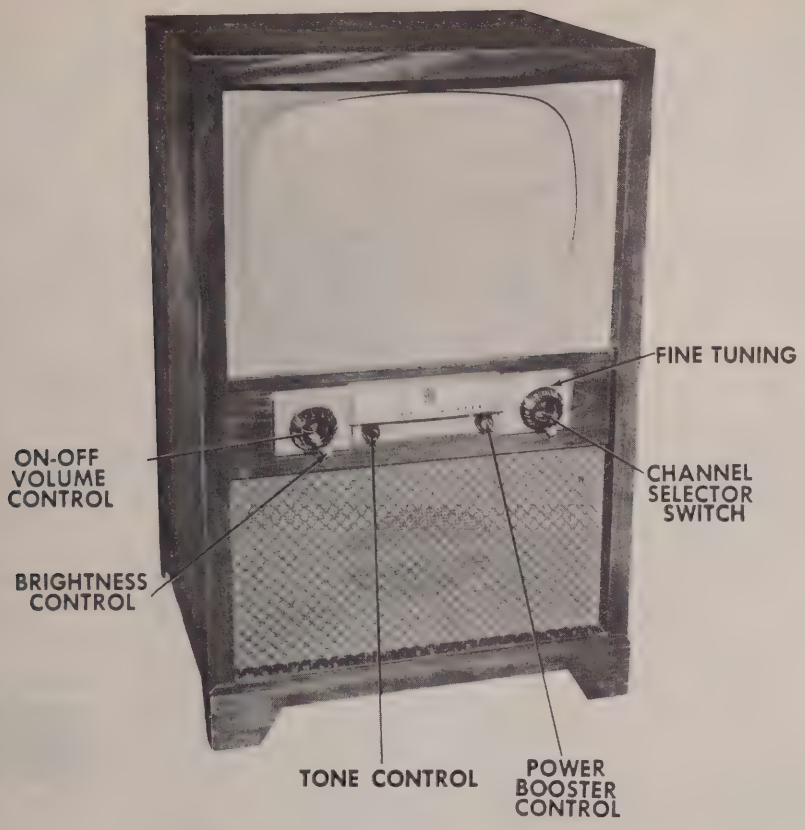

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STEWART-WARNER MODEL 21C-9300E

TRADE NAME	Stewart-Warner	MODELS	SERIES
		21C-9300E, 21C-9300F, 21C-9300G, 21C-9300K, 21C-9300KB, 21C-9300L, 21C-9300LB, 21C-9300M, 21C-9300MB, 21C-9300P	A thru T
		21T-9300A, 21T-9300AA, 21T-9300B, 21T-9300D, 21T-9300H, 21T-9300HA, 21T-9300R, 21T-9300RB, 21T-9300S, 21T-9300T	A thru T
MANUFACTURER	Stewart-Warner Electric, Div. of Stewart-Warner Corp., 1300 N. Kostner Ave., Chicago 15, Ill.		
TYPE SET	Television Receiver		
TUBES	Nineteen		
POWER SUPPLY	110-120 Volts AC-60 Cycle	RATING 1.7 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13, Video IF 26.6MC, Sound IF 22.1MC (Intercarrier)		

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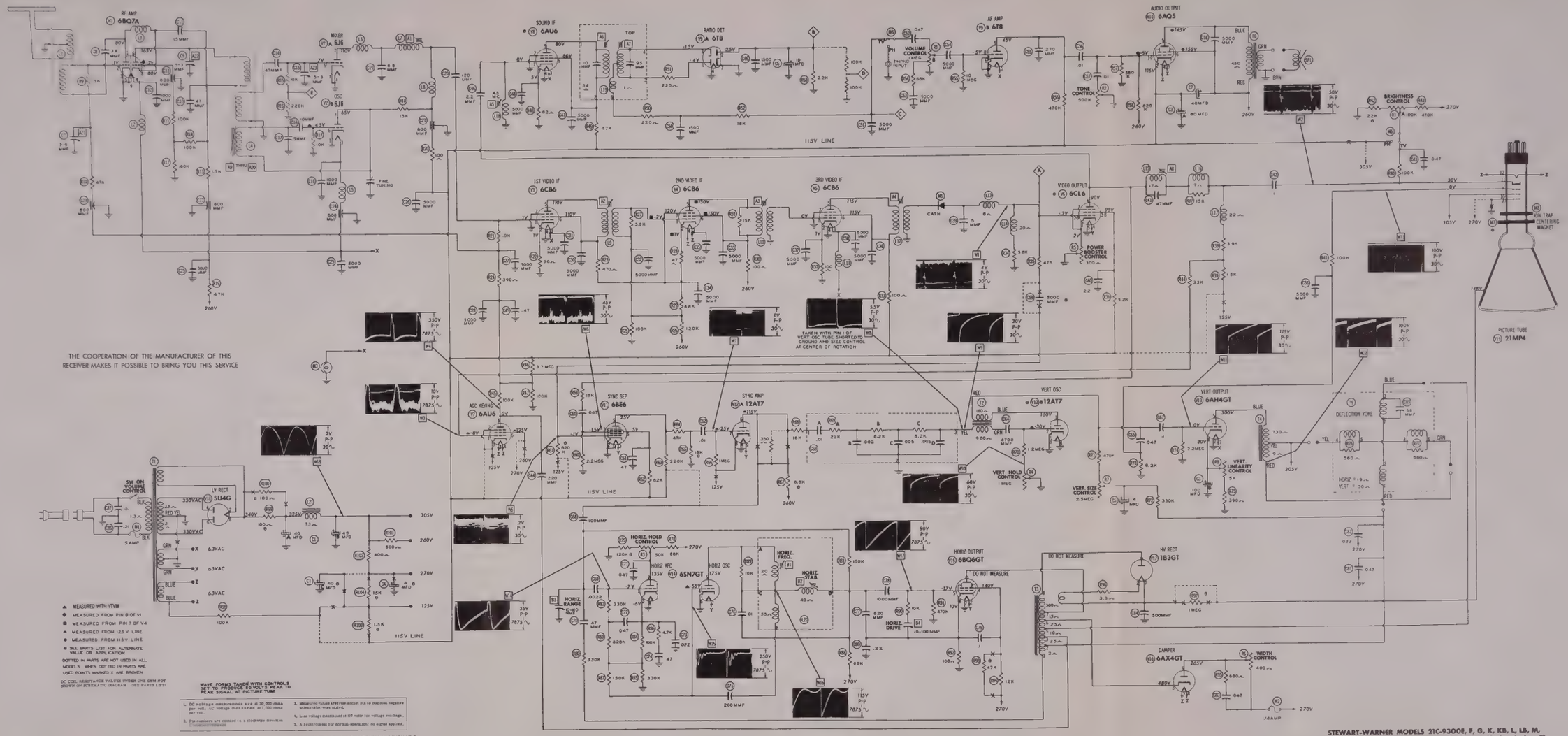
RF AMP V1 6BQ7A
MIXER V2A 6J6
OSC V2B 6J6
SOUND IF V8 6AU6
RATIO DET V9A 6T8
AF AMP V9B 6T8
AUDIO OUTPUT V10 6AQ5
1ST VIDEO IF V3 6CB6
2ND VIDEO IF V4 6CB6
3RD VIDEO IF V5 6CB6
VIDEO OUTPUT V6 6CL6
AGC KEYING V7 6AU6
SYNC SEP V11 6BE6
SYNC AMP V12A 12AT7
VERT OSC V12B 12AT7
VERT OUTPUT V13 6AH4GT
HORIZ AFC V14 6SN7GT
HORIZ OUTPUT V15 6BQ6GT
LV RECT V16 5U4G
HV RECT V17 1B3GT
DAMPER V16 6AX4GT
PICTURE TUBE V18 21MP4
115V LINE
TONE CONTROL
VOLUME CONTROL
BRIGHTNESS CONTROL
POWER BOOSTER CONTROL
VERT. LINEARITY CONTROL
VERT. SIZE CONTROL
VERT. HOLD CONTROL
HORIZ. HOLD CONTROL
HORIZ. FREQ.
HORIZ. STAB.
HORIZ. DRIVE
HORIZ. RANGE
WIDTH CONTROL
ION TRAP CENTERING MAGNET
DEFLECTION YOKE
FINE TUNING
ON VOLUME CONTROL
DO NOT MEASURE
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
▲ MEASURED WITH VTVM
◆ MEASURED FROM PIN 8 OF V1
■ MEASURED FROM PIN 7 OF V4
▲ MEASURED FROM 125 V LINE
● MEASURED FROM 115 V LINE
⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED X ARE BROKEN
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK TO PEAK SIGNAL AT PICTURE TUBE
1. DC voltage measurements are at 20,000 ohms per volt; AC voltage measured at 1,000 ohms per volt.
2. Pin numbers are counted in a clockwise direction
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.
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STEWART-WARNER MODELS 21C-9300E, F, G, K, KB, L, LB, M, MB, P, 21T-9300A, AA, B, D, H, HA, R, RB, S, T (Series A thru T)

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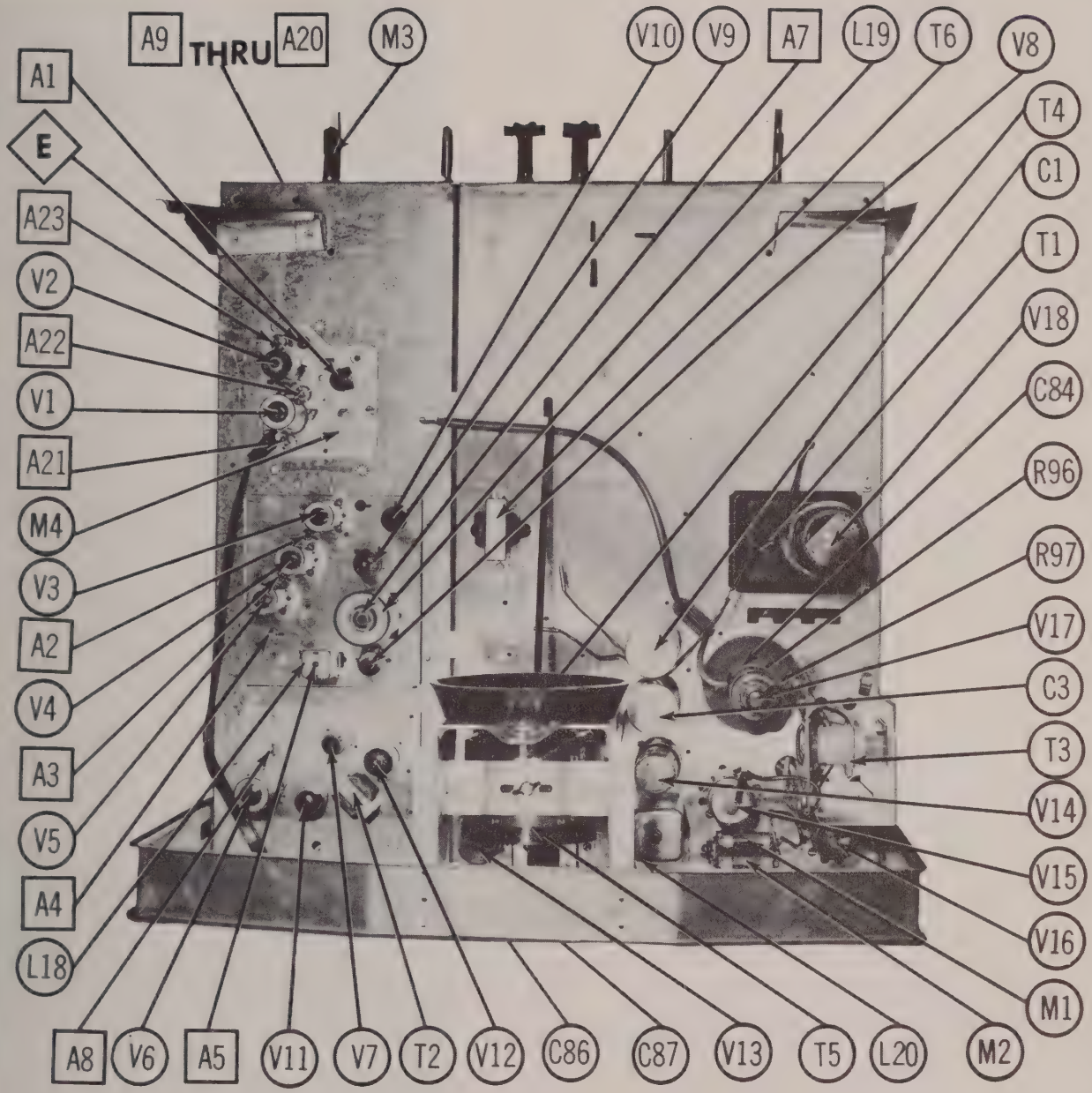
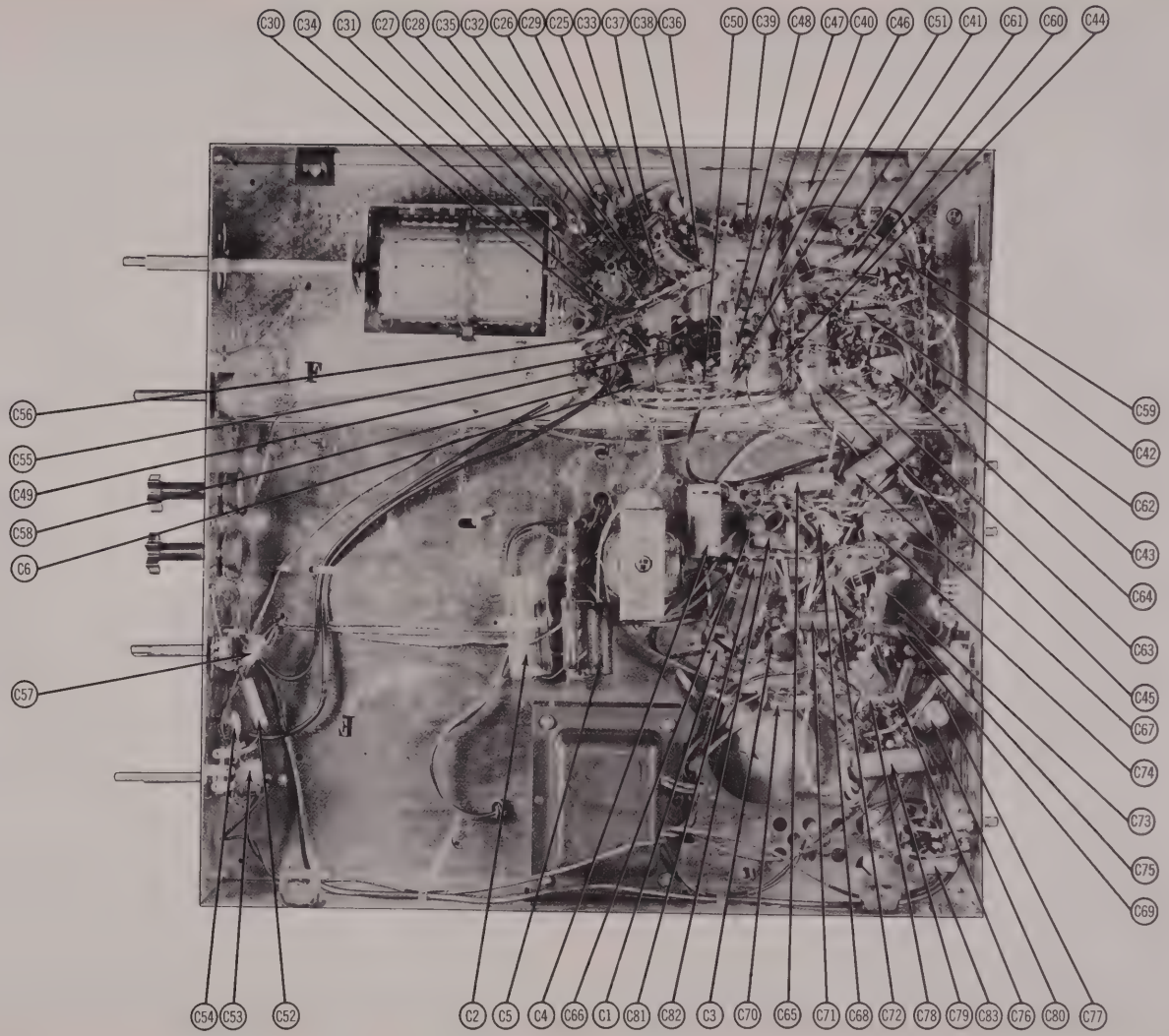


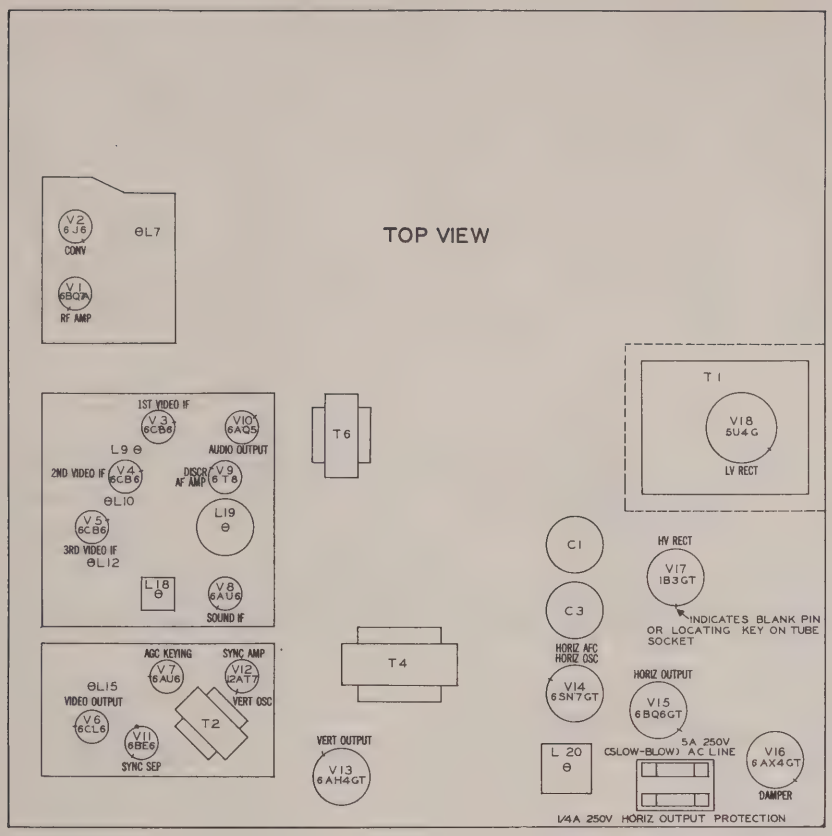
CHASSIS TOP VIEW

SET 223 FOLDER 12



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART



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TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V18, Fuse (M1)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V10
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V19
Has pic, no sound - V8, V9, V10
Overloaded picture - V7

SYNC FAILURE
No vert. sync - V12, V13
No horiz. sync - V12, V14
No vert. or horiz. sync - V11, V12

SWEEP FAILURE
No raster, has sound - V14, V15, V16, V17, V19, Fuse (M2)
No vertical deflection - V12, V13
Poor vert. linearity or foldover -V12, V13
Poor horiz. linearity or foldover - V14, V15, V16
Narrow picture - V14, V15, V16, V17, V18
Vert. off freq. -V12, V13
Horiz. off freq. - V12, V14

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage hazard may be eliminated by removing the horizontal oscillator tube (V14) from its socket.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 which has pin 1 removed. This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the negative terminal of a 3 volt battery to the ungrounded side of C45. Connect the positive side to chassis.
If the IF stages should break into oscillation during alignment it will be indicated by excessive deflection on the VTVM. Also, the voltage due to IF oscillation will be unaffected by signal strength from the generator. When IF oscillation is encountered it may be eliminated by detuning the IF coils in different directions or increasing the bias from 3 volts to 4.5 volts. If the IF stages are aligned using 4.5 volts bias the IF channel should be stable with the bias reduced to 3 volts.
Frequencies marked with an asterisk (*) should be used on chassis which does not have the letter "P" in the series designation on rear of chassis.
Frequencies marked with a dagger (†) should be used on chassis which have a letter "P" in the series designation on rear of chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	23.4MC * 23.5MC † (Unmod)	Any	DC probe to point (A). Common to chassis.	A1, A2	Adjust for maximum deflection.
2.	Direct	"	26.2MC * 25.9MC †	Any	"	A3, A4	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.	Direct	High side to an ungrounded tube shield floating over dummy coverter tube. Lowside to chassis.	25MC (10MC Swp)	26.6MC* 22.1MC* 26.0MC† 21.5MC†	Any	Vert. amp thru 10KΩ to point (A). Lowside to chassis.		Check for response curve similar to fig. 1. If necessary retouch A1 thru A4 for desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect the two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistor is alignment point (D) as shown on the schematic.
Short antenna terminals together.
Let power booster control fully counter clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	.001MFD	High side to point (A). Lowside to chassis.	4.5MC (Unmod)	Any	DC probe to point (B). Common to chassis.	A5, A6	Adjust for maximum deflection.
5.	"	"	"	"	DC probe to point (C). Common to point (D).	A7	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

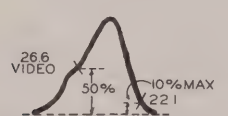
SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use a 120∿ sawtooth voltage in scope for horizontal deflection.

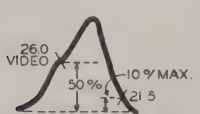
	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. amp to point (B). Low side to chassis.	A5, A6	Disconnect stabilizer capacitor C6. Adjust for curve of maximum amplitude and symmetry as in fig. 2.
5.	"	"	"	"	"	Vert. amp to point (C). Low side to chassis.	A7	Reconnect stabilizer capacitor C6. Adjust so that 4.5 MC occurs at center of crossover lines as in fig. 3. Slightly retouch A6 for maximum amplitude and straightness of crossover lines.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (fig. 4)	A8	Adjust for MINIMUM deflection.



VIDEO IF RESPONSE FOR SETS NOT HAVING LETTER "P" IN SERIES DESIGNATION ON REAR OF CHASSIS.



VIDEO IF RESPONSE FOR SETS HAVING LETTER "P" IN SERIES DESIGNATION ON REAR OF CHASSIS.

FIG. 1

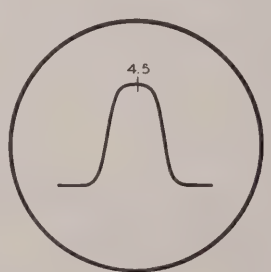


FIG. 2

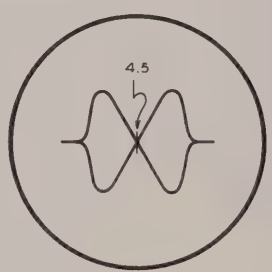


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

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OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
The channel oscillator adjustments are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.
Connect a 3 volt bias battery as under Video IF Alignment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to point ◇A◇. Low side to chassis.	A9	Adjust to place sound marker as shown in Fig. 5. Video marker should be at 50%.
			213MC (10MC Swp)	211.25MC 215.75MC	13		A10	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A11	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A12	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A13	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A14	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A15	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A16	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A17	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A18	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A19	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A20	

RF AND MIXER ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to point ◇E◇. Low side to chassis.	A21, A22, A23	Adjust for response curve similar to Fig. 6.
9.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"		Check for response curve similar to Fig. 6. If markers fall below 70% on any channel make slight compromise adjustments of A21, A22 and A23 with channel switch set to that channel then recheck all other channels to see that they have not been seriously affected.

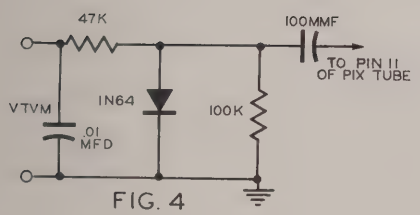


FIG. 4

FIG. 5

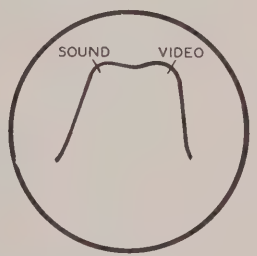


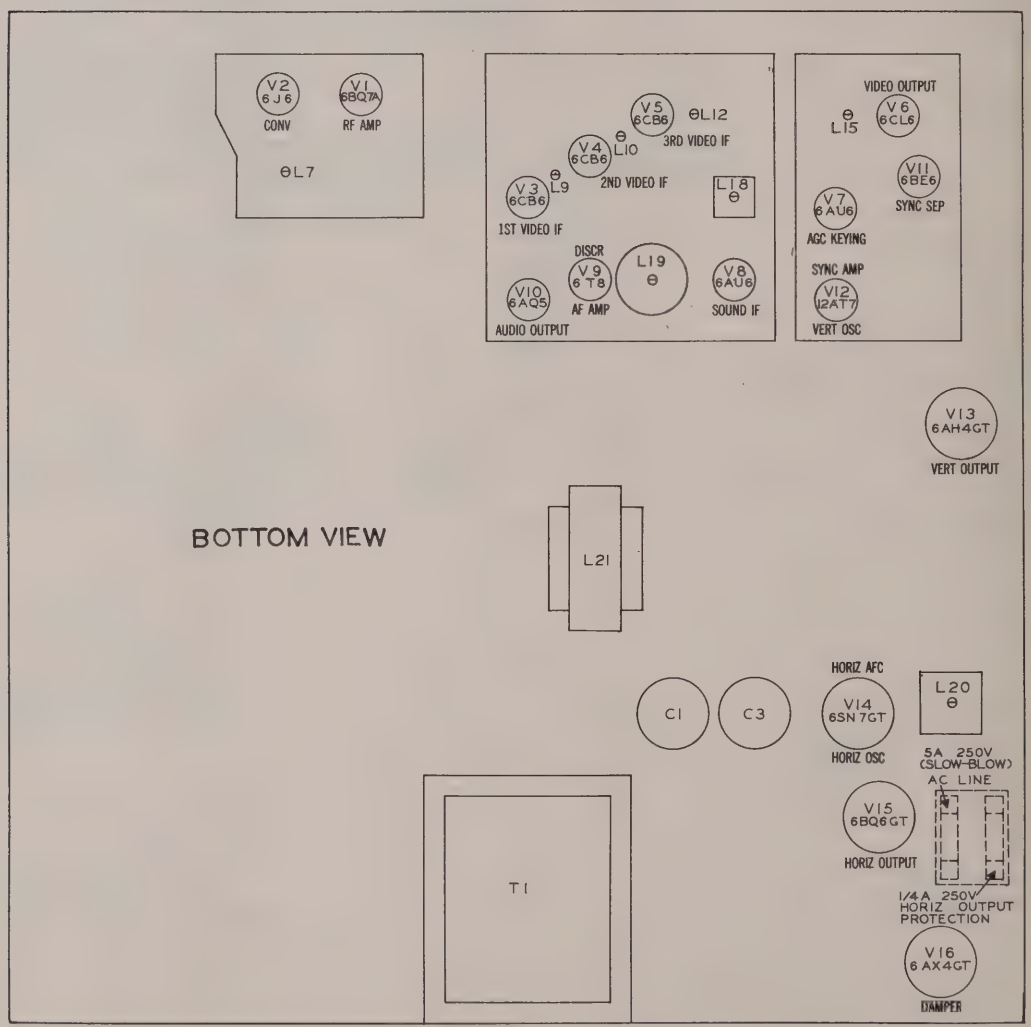
FIG. 6

STEWART-WARNER MODELS 21C-9300E, F, G, K, KB, L, LB, M, MB, P, 21T-9300A, AA, B, D, H, HA, R, RB, S, T (Series A thru T)

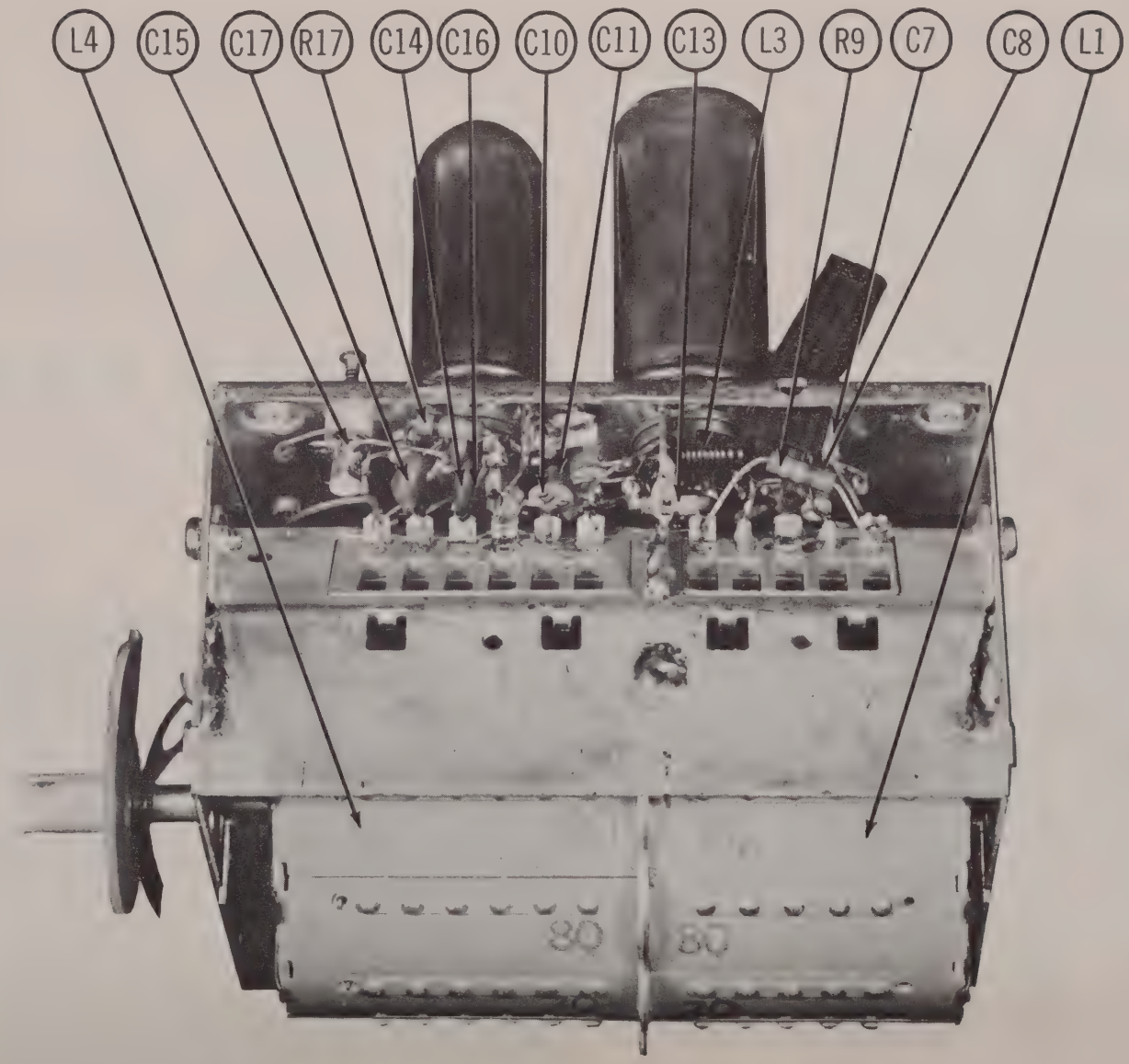
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	147KΩ	0Ω	.1Ω	0Ω	†6.8KΩ	†200KΩ	INF	0Ω
V 2	6J6	†32KΩ	†17KΩ	.1Ω	0Ω	230KΩ	10KΩ	0Ω		
V 3	6CB6	110KΩ	68Ω	.1Ω	0Ω	■470Ω	■470Ω	0Ω		
V 4	6CB6	†65KΩ	†70KΩ	†110KΩ	†110KΩ	†780Ω	†780Ω	†70KΩ		
V 5	6CB6	.4Ω	100Ω	.1Ω	0Ω	†17KΩ	†17KΩ	0Ω		
V 6	6CL6	80Ω	5.6KΩ	INF	.1Ω	0Ω	†21KΩ	80Ω	†25KΩ	5.6KΩ
V 7	6AU6	†50KΩ	†15.5KΩ	†110KΩ	†110KΩ	200KΩ	†670Ω	†15.KΩ		
V 8	6AU6	.9Ω	0Ω	.1Ω	0Ω	†21.7KΩ	†21.7KΩ	82Ω		
V 9	6T8	INF	22KΩ	INF	0Ω	.1Ω	0Ω	0Ω	10Meg	†485KΩ
V 10	6AQ5	340KΩ	20KΩ	†110KΩ	†110KΩ	†1.2KΩ	†700Ω	340KΩ		
V 11	6BE6	†835KΩ	0Ω	.1Ω	0Ω	†70KΩ	†99KΩ	2.2Meg		
V 12	12AT7	▲2.9Meg	2.1Meg	0Ω	0Ω	0Ω	†7.5KΩ	†1Meg	†15.5KΩ	.1Ω
V 13	6AH4GT	2.2Meg	0Ω	†110KΩ	INF	†800Ω	†110KΩ	.1Ω	1.5KΩ	
V 14	6SN7GT	1.5Meg	†75KΩ	430KΩ	480KΩ	†68KΩ	0Ω	.1Ω	0Ω	
V 15	6BQ6GT	†523Ω	.1Ω	480KΩ	†10.1KΩ	470KΩ	†68KΩ	0Ω	100Ω	TOP CAP ▲15Ω
V 16	6AX4GT	INF	†668Ω	1.1Meg	†523Ω	†600Ω	†523Ω	†110KΩ	†110KΩ	
V 17	1B3GT	PINS 1 - 8 HAVE INF RESISTANCE								TOP CAP ▲375Ω
V 18	5U4G	INF	45KΩ	INF	23Ω	INF	21Ω	INF	45KΩ	
V 19	21MP4	†110KΩ	108KΩ	PIN 6 0Ω	PIN 10 †73Ω	PIN 11 130KΩ	PIN 12 †110KΩ			

▲ MEASURED FROM PIN 3 OF V16
† MEASURED FROM PIN 8 OF V18
■ MEASURED FROM PIN 7 OF V4.



TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE

PROPERTY OF
L. F. BLANKENSHIP
3984 MEADE ST.
DENVER, COLORADO

RF TUNER-BOTTOM VIEW

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V14, V15, V16 and V18. Check waveform W17.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C79, R93 and R94. Check other associated circuit components.	Check C75, C76, C77, C78, L20, R87, R89, R91 and other associated circuit components.

DRIVE LINES

Check adjustment of horiz. drive trimmer (B4). Check by substituion V14, V15 and V16. Check T3 and T5A. Check Boost B+ filter components.

COMPRESSED LEFT SIDE

Check by substitution V14, V15 and V16. Check adjustment of width control. Check adjustment B4. Check T3, T5A, C83 and R95.

FOLDS

Check by substitution V14, V15 and V16. Check components associated with the horizontal output stage.

XMAS TREE EFFECT

Substitute V14. Check L20, C75, C76, C77, C78 and other associated circuit components.

VERTICAL

LOSS OF SWEEP

Check by substitution V12 and V13. Check waveform W11.

If Satisfactory	If Unsatisfactory
Check T4, T5B and other associated circuit components.	Check C65, C67, R71, R72, R74 and other associated components.

INSUFFICIENT SWEEP

Check adjustment of height and vertical linearity controls. Check by substitution V12 and V13. Proceed as outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Check by substitution V12 and V13. Check R71, R72, R7, C5 and other associated circuit components.

COMPRESSED AT TOP

Check by substitution V12 and V13. Check T4, T5B, C3B, R75, R8 and other associated circuit components.

FOLDS

Substitute V12 and V13. Check components associated with V12B and V13.

SYNC

HORIZONTAL

LOSS OF SYNC

Substitute V14. Check associated circuit components especially C68, C69, C70, C75, C76, C78, L20, R87, R81 and R88.

CRITICAL HOLD

Check by substitution V11, V12 and V14. Proceed as outlined under "Loss of Sync".

BENDING OR S-ING

Check by substitution V11, V12, V14 and V15. Check Horiz. AFC circuit and components.

VERTICAL

LOSS OF SYNC

Check by substitution V11 and V12. Check waveform W8.

If Satisfactory	If Unsatisfactory
Check T2, C64, R4 and R70.	Vertical integrator and other components associated with V11 and V12A.

CRITICAL HOLD

Follow procedure outlined under "Loss of Sync".

TRIGGERING

Check V11, V12 and V13 for heater to cathode leakage. Check circuit near these stages for proper filament lead dress.

VIDEO

LOSS OF VIDEO

Check R40, C42, picture tube and other associated components.

SOUND BARS (4.5 MC BEAT)

Check adjustment of fine tuning and local oscillator. Check adjustment of 4.5 MC trap A8. Check video IF alignment.

NEGATIVE PIX

Check by substitution V1, V2, V3, V4, V5, V6 and V7. Check AGC network for proper operation. Check picture tube and other associated circuit components.

POOR CONTRAST

Substitute V6. Check video detector crystal and assembly. Check video IF tubes and alignment. Check picture tube and other associated components.

SMEAR

Substitute V6. Check video detector crystal and assembly. Check R36, R38, R39, R40 and R5 for change of value. Check C40, C42 and C43. Check L16, picture tube and other associated circuit components.

WIDE BLACK BAR ACROSS PIX

Check V1, V2, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9 and V10. Check stages V9B and V10 using audio signal generator. Apply signal across R55.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V9B and V10.

BUZZ

Substitute V9. Realign ratio detector following procedure outlined in the alignment section. Check C6 and C49. Check other associated circuit components. Check local oscillator alignment.

DISTORTED

Check by substitution V8, V9 and V10. Check stages of V9B and V10 using audio signal generator and scope.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V9B and V10.

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PRODUCTION CHANGES

The receivers incorporating the following changes are identified by coding stamped on rear surface of chassis. The coding consists of one or more letters following the word "Series", "Series B", "Series AC", etc, and corresponds to similarly lettered changes shown below. Chassis incorporate only that change indicated by letter designation, i.e., chassis stamped "Series BE" does not include changes "A" or "C" or "D".

CODE "A"

The following change was incorporated to maintain a better balance of filament voltage on the tubes connected across the 12.6VAC winding of the power transformer, T1 in the event of tube failure or removal from socket. The center tap of the 12.6VAC filament winding is connected to ground through the common red and yellow lead. Transformers not having this modification have a red identification dot on the bottom side.

CODE "B"

The following changes were incorporated to improve focus at high brightness levels.

1. Change the resistor R42, connected from one end of the brightness control, from 15KΩ to 22KΩ.
2. Disconnect pin 6 of picture tube (V19) from the 270 volt line and connect to chassis ground.
3. Disconnect R40 from phono switch (M6) from the 305 volt line and connect to the 115 volt line.

CODE "C"

This change was made to increase the horizontal sync stability on strong signal levels.

1. Change connection of capacitor C68 in grid circuit (Pin 1) of V14 from junction of resistors in the plate circuit of V12 (See Code "Q", step 7B).
2. Change resistor R79 in plate circuit of V14 from 100KΩ to 120KΩ.
3. Change resistor R61 in grid circuit of V11 from 1.2 Meg to 820KΩ.

CODE "D"

The following changes were made to extend range of the width control.

1. Change resistor R99 at the output of V18 from 100Ω to 50Ω.
2. Add resistor R93 in parallel with resistor R94 locateded in screen circuit of V15.

CODE "E"

The following changes were made to facilitate production techniques. Two interconnecting sockets and plugs were added.

CODE "F"

The following changes were made to minimize the possibility of critical horizontal holding action when changing channels.

1. Add capacitor C45 between resistor R35 and pin 1 of V11. NOTE: When undertaking this change be sure that Series "C" is also incorporated.

The following changes were made to minimize buzz and hum in the audio system.

1. Add resistors R103 and R104 in series between the 115 volt line and the 270 volt line. The junction of these two resistors (R103&R104), provides the 125 volt source.
2. Relocate capacitor C1C (40MFD) from 270 volt line to the 125 volt line and add capacitor C4 (4MFD) to the 270 Volt line, in the same position formerly occupied by C1C.
3. Disconnect pins 2 and 7 of V7, from 115 volt line and connect to the 125 volt line.
4. Disconnect resistor R61 in grid circuit of V11 from the 115 volt line and connect to the 125 volt line.

CODE "F" (Con't)

5. Disconnect resistor R66 in grid circuit of V12 from 115 volt line and connect to the 125 volt line.
6. Disconnect pin 8 of V12 from 115 volt line and connect to the 125 volt line.
7. Disconnect pin 6 of V7 from 270 volts line and connect to the 260 volt line.
8. Remove 3.3KΩ resistor in plate circuit of V12 and change resistor R67 from 3.3KΩ to 6.8KΩ.

The following changes were incorporated to reduce the amount of undesired video signal present in sync pulse.

1. Change resistor R63 in plate circuit of V11 from 330KΩ to 220KΩ.
2. Change resistor R65 in plate circuit of V11 from 12KΩ to 6.8KΩ.

CODE "G"

The following change was made to improve the shape of the sync pulse.

1. Change resistor R65 in plate circuit of V11, to 18KΩ. Chassis that have the letter "F" in series designation were produced with a 6.8KΩ resistor. Chassis that do not have the letter "F" in series designation were produced with a 12KΩ resistor.

CODE "H"

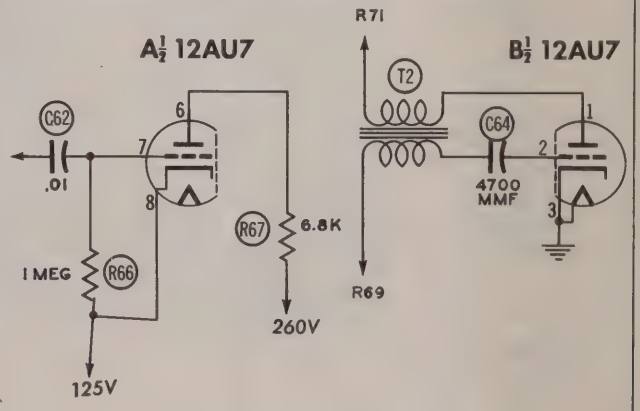
The following change was made to minimize horizontal oscillator drift thus improving horizontal hold action.

1. Change capacitor C77 in plate circuit of V14 from a ceramic type 820MMF to a mica type 820 MMF, ±5%, 500 volts.

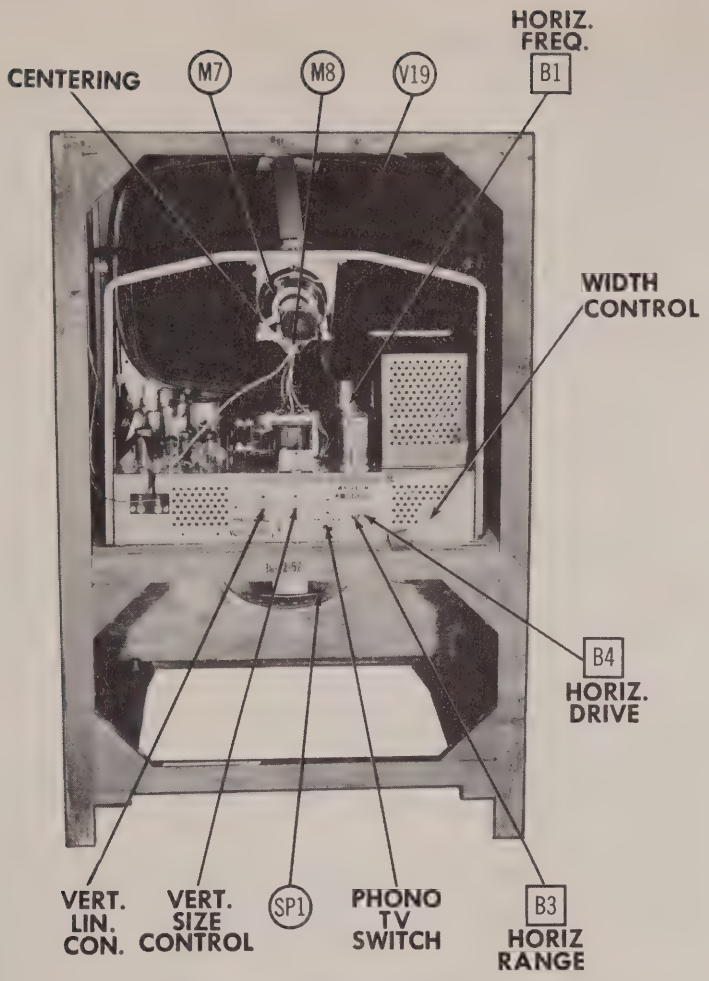
CODE "J"

The following changes were made to provide for the use of an alternate type tube.

1. Change V12 from a .12AT7 to a 12AU7. (See circuit below)



2. Change capacitor C66 in grid circuit of V19 (Picture tube) from 5000MMF to a .03MFD.



CABINET—REAR VIEW

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

DISASSEMBLY INSTRUCTIONS

1. Remove 6 push on type control knobs from front panel.
2. Remove 7 wood screws and 1 metal screws . Remove rear cover.
3. Disconnect built-in antenna and speaker.
4. Remove 4 chassis bolts. Remove chassis.
5. Remove 4 speaker nuts. Remove speaker.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: Stewart-Warner PART No.	STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1A	RF Amplifier		6BQ7A	9AJ	
V1B	RF Amplifier		6BZ7	9AJ	
V2	Converter		6J6	7BF	
V3	1st Video IF Amp.		6CB6	7CM	
V4	2nd Video IF Amp.		6CB6	7CM	
V5	3rd Video IF Amp.		6CB6	7CM	
V6A	Video Output		6CL6	9BF	
B	Video Output		12BY7	12BY7	
V7	AGC Keying		6AU6	6AU6	7BK
V8	Sound IF Amp.		6AU6	6AU6	7BK
V9	Ratio Detector - AF Amplifier		6T8	6T8	9E
V10	Audio Output		6AQ5	6AQ5	7BZ
V11	Sync Separator		6BE6	6BE6	7CH
V12A	Sync Amplifier - Vert. Oscillator		12AT7	12AT7	9A
B	Sync Amplifier - Vert. Oscillator		12AU7	12AU7	9A
V13	Vert. Output		6AH4GT	6AH4GT	8EL
V14	Horiz. Afc-Horiz. Oscillator		6SN7GT	6SN7GT	8BD
V15	Horiz. Output		6BQ6GT	6BQ6GT	8AM
V16	Damper		6AX4GT	6AX4GT	4CG
V17	HV Rectifier		1B3GT	1B3GT	8C
V18	LV Rectifier		5U4G	5U4G	6T

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: Stewart-Warner PART No.	SYLVANIA PART No.	GENERAL ELECTRIC PART No.	RTMA BASE TYPE	NOTES
V19	21MP4	21MP4		12C	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: Stewart-Warner PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	±40	450	508072	AFH3-44		CO35		FP377	TVL-3787	
B	±40	450								Note 1
C	±40	450								
C2	40	300	160095	PR8450/40		BR4035		TC78	TVA-1611	
C3A	±80	250	509002	AFH3-142		C109		FP375	TVL-3722	
B	±100	50								
C4	4	450	504719	PR8450/4		BR445		TC70	TVA-1702	Note 1
C5	4	450	504719	PR8450/4		BR445		TC70	TVA-1702	
C6	10	150	505174	PR8350/10		BR1015		TC42	TVA-1406	
C7	3-9				828-10		NP0K-3R6			
C8	3.6									
C9	.5-3				829-3			CT65A		
C10	47			BPD-000047	D6-470	TM5Q6	GP1K-470	UC-5447	5GA-Q47	
C11	1.5			SL5NP0	TCZ-1.5		NP0K-1R5	UT-5515	5TCCB-V15	
C12	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C13	800			CN-1-001	MFT-1000				503C-D1	
C14	47			BPD-000047	D6-470	TM5Q6	GP1K-470	UC-5447	5GA-Q47	
C15	.5-3				829-3			CT65A		
C16	10			SL0NP0	TCZ-10		NP0K-100	XT-541	5TCC-Q1	
C17	5			SL5NP0	TCN-5		N750K-050	NT-555	5TCUB-V5	
C18	1000			BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C19	6.8			SI6.8NP0	TCZ-6.8		NP0K-6R8	ZT-5568	5TCCB-V6	
C20	120			BPD-00012	D6-121	TM5T12	GP2K-121	UC-5312	5GA-T12	
C21	800			CN-1-001	MFT-1000				503C-D1	
C22	800			CN-1-001	MFT-1000				503C-D1	
C23	800			CN-1-001	MFT-1000				503C-D1	
C24	800			CN-1-001	MFT-1000				503C-D1	
C25	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C26	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C27	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C28	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C29	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C30	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C31	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C32	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C33	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C34	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C35	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C36	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C37	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C38	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C39	5		513432	SI5NP0	TCZ-4.7		NP0K-050	ZT-556	5TCCB-V47	
C40	.22	200	512236	PZ88-22		PTE4P22		PT4021	2TM-P33	
C41	47		512438	SI47NP0	TCZ-47		NP0K-470		5TCC-Q47	
C42	.1	200	512216	PZ88-1	DF-104	PTZP1		PT401	2TM-P1	
C43	.047	200	512235	PZ88-047	DF-503	PTE4S47		PT4147	2TM-S47	
C44	220	1000	513032	HVD15-00022		MCE322		MC8322	10CA-B-T22	
C45	.47	200	512239	PZ88-47		PZ2P5		PT405	2TM-P47	
C46	2.2		513001	SI2.2NP0	TCZ-2.2		NP0K-2R2		5TCCB-V22	
C47	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C48	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C49	1500		513010	SI1500	D6-152	TM5D15	801-0015	UC-5315	5HK-D15	
C50	1500		513010	SI1500	D6-152	TM5D15	801-0015	UC-5315	5HK-D15	
C51	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C52	.047	200	512235	PZ88-047	DF-503	PTE4S47		PT4147	2TM-S47	
C53	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C54	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C55	270		513006	SI270	D6-271		GP1K-271	UC-5327	5GA-T27	
C56	.01	400	512206	PZ88-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C57	.01	400	512204	PZ88-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C58	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: Stewart-Warner PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C59	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	Note 2
C60	.047	200	512235	PZ88-047	DF-503	PTE4S47		PT4147	2TM-S47	
C61	.47	200	512239	PZ88-47		PZ2P5		PT405	2TM-P47	
C62	.01	400	512205	PZ88-01	D6-103	PTE4S1	GP2-333-103	PT411	4TM-S1	
C63A	.01			(PZ88-01)		(PTE4S1)		(PT611		
B	.002		⌖508062	(PZ88-002	†PC-100	(PTE5D2	¶1405-01	(PT625	*101C1	
C	.005			(PZ88-005	DD-1002	(PTE5D5	811-01	(PT635	5HK-81	
D	.005			(PZ88-D05		(PTE5D5		(PT635		
C64	4700	1000	512533							
C65	.047	400	512236	PZ88-047	DF-503	PTE4S47		PT4147	4TM-S47	
C66	5000		513013	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C67	.1	600	512218	PZ68-1	DF-104	PTE6P1		MCB235	M5-31	
C68	100	500	512503	1405-0001		SR671		PT6222	5TM-D22	
C69	.0022	400	512232	PZ68-0022	D6-222	PTE6D22	GP2-333-222	PT6122	5TM-D22	
C70	47	1000	513030	HVD15-000047	D15-470	TM1DQ47		MC1447	10CAB-Q47	
C71	.047	400	512236	PZ88-047	DF-503	PTE4S47		PT4147	4TM-S47	
C72	.047	200	512235	PZ88-047	DF-503	PTE4S47		PT4147	2TM-S47	
C73	.022	400	512233	PZ88-022	DF-303	PTE4S22		PT405	2TM-S22	
C74	.47	200	512239	PZ88-47		PZ2P5		PT405	2TM-P47	
C75	200		513427					MCB237		
C76	.01	200	512205	PZ88-01		PTE4S1		PT411	4TM-S1	
C77	820	500	513021							
C78	1000		513009	SI1000	D6-102	TM5D1	GP3L-102	UC-521	5HK-D1	
C79	.1	600	512218	PZ68-1	DF-104	PTE6P1		PT601	6TM-P1	
C80	.22	200	512238	PZ88-22		PTE4P22		PT4025	4TM-P22	
C81	.047	600	512237	PZ68-047		PTE6S47		PT6147	6TM-S47	
C82	.022	600	512234	PZ68-022		PTE6S22		PT6122	6TM-S22	
C83	.047	200	512235	PZ88-047		PTE4S47		PT4147	2TM-S47	
C84	500	20000	530990	HV20C	TV3-502	MM-C20T5	413-501		20DK-T5	
C85	56	1500	513027							
C86	.01	600	512206	PZ68-01		PJ681		PT611	6TM-S1	
C87	.01	600	512206	PZ68-01		PJ681		PT611	6TM-S1	

Note 1. Chassis with letter "F" not included in the series designation replace C4 with C1C and omit C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63A, B, C, D, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87.

Note 2. Chassis with letter "F" not included in the series designation omit C59.

* Items C63A, C63B, C63C, C63D, R69A, R69B, R69C are combined in one unit.

† Install 81J-01 in series with 1405-01 input lead to replace original Mfgr's unit.

‡ Install DD-1023 in series with PC-100 input lead to replace original Mfgr's unit.

¤ Install 58E-S1 in series with 101C1 input lead to replace original Mfgr's unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: Stewart-Warner PART No.	IRC PART No.	CIAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	100KΩ	½	531080	QJ-471*			UF15L	Brightness-Panel
B	1Meg	½					UR10T25 †	Volume-Tapped ① 200KΩ-Rear
	Switch						U8-26	Attach to R1B
R2A	500KΩ	½	520746	QU-133	AG-58-8	AB-59	U-50	Tone
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R2A
R3A	50KΩ	½	521059	QU-123	AG-44-8	AB-31	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R3A
R4A	1Meg	½	531058	QU-137	AG-61-8	AB-69	U-54	Vert. Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R4A
R5A	300Ω	½	521057	QU-103	AG-5-8	AB-4	R500L	Power Booster
	Shaft		Not Req.	Not Req.	KS8-3	AK-4	DE-36	Attach to R5A
R6A	400Ω	4	520996	4WK-400	A10-400	SVP-991	M400P	Width-Wire Wound
B	Shaft		Not Req.	Not Req.	Not Req.	AK-1	Not Req.	Attach to R6A
R7A	2.5Meg	½	520944	QU-239	AG-84-8	AB-83	SU-503	Vert. Size
B	Shaft		Not Req.	Not Req.	FK8-1/4	AK-1	Not Req.	Attach to R7A
R8A	5000Ω	½	520945	QU7-114	AG-19-8	AB-12	SU-14	Vert. Linearity
B	Shaft		Not Req.	Not Req.	FK8-1/4	AK-1	Not Req.	Attach to R8A

* Concentrikit Equivalent-Kit K-2, Base Elements & Shafts B11-138 & P1-123 (Panel B13-137X & R1-216 (Rear) & Switch 76-1.

† Universal Replacement- (Mallory Exact Duplicate Part No. UE12408).

RESISTORS

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Stewart-Warner PART No.	IRC PART No.	NOTES
R9	15KΩ	½		BTS-15K	
R10	47KΩ	½		BTS-47K	
R11	100KΩ	½		BTS-100K	
R12	1600Ω 5%	½			
R13	1500Ω	½		BTS-1500	
R14	100KΩ 5%	½			
R15	10KΩ	½			
R16	220KΩ	½			
R17	10KΩ	½		BTS-10K	
R18	15KΩ	½		BTS-15K	
R19	4700Ω	2	510348	BTB-4700	
R20	100Ω	½	510116	BTS-100	
R21	100Ω	½	510164		
R22	68Ω	½	510116	BTS-68	
R23	470Ω	½	510130	BTS-470	
R24	390Ω	½	510129	BTS-390	
R25	100KΩ	½	510172	BTS-100K	
R26	120KΩ	½	510174	BTS-120K	
R27	5600Ω	½	510150		
R28	47Ω	½	510113	BTS-47	
R29	5800Ω	½	510151		
R30	100Ω	½	510118	BTS-100	
R31	15KΩ	½	510157		
R32	100Ω	½	510118	BTS-100	
R33	100Ω	½	510118	BTS-100	
R34	5800Ω	½	510150	BTS-5800	
R35	47KΩ	½	510168	BTS-47K	
R36	8200Ω	½	510153	BTS-8200	
R37	15KΩ	½	510744	BTS-15K	
R38	3900Ω	½	510247	BTA-3900	
R39	1500Ω	½	510139	BTS-1500	
R40	100KΩ	½	510172	BTS-100K	
R41	100KΩ	½	510172	BTS-100K	

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Stewart-Warner PART No.	IRC PART No.	NOTES
R43	470KΩ	½	510184	BTS-470K	
R44	33KΩ	½	510163	BTS-33K	
R45	100KΩ	½	510172	BTS-100K	
R46	3.3Meg	½	510701	BTS-3.3Meg	
R47	100KΩ	½	510172	BTS-100K	
R48	82Ω	½	510117	BTS-82	
R49	4700Ω	1	510249	BTA-4700	
R50	220Ω	½	510124	BTS-220	
R51	220Ω	½	510124	BTS-220	
R52	18KΩ	½	510159	BTS-18K	
R53	22KΩ	½	510160	BTS-22K	
R54	68KΩ	½	510169	BTS-68K	
R55	10Meg	½	510197	BTS-10Meg	
R56	470KΩ	½	510184	BTS-470K	
R57	560KΩ 5%	½	510778	BTS-560K 5%	
R58	820KΩ 5%	½	510747	BTS-820K 5%	
R59	18KΩ	½	510159	BTS-18K	
R60	2.2Meg	½	510193	BTS-2.2Meg	
R61	820KΩ 5%	½	510189	BTS-820K 5%	Note 2
R62	82KΩ	½	510171	BTS-82K	
R63	220KΩ	½	510178	BTS-220K	Note 8
R64	47KΩ	½	510166	BTS-47K	
R65	18KΩ	½	510159	BTS-18K	Note 9
R66	1Meg	½	510190	BTS-1Meg	
R67	6800Ω	½	510151	BTS-6800	Note 7
R68	18KΩ	½	510159	BTS-18K	
R69A	22KΩ	½		BTS-22K	
B	8200Ω	½	⌖508062	BTS-8200	
C	8200Ω	½		BTS-8200	
R70	1.2Meg 5%	½	510777	BTS1.2Meg 5%	
R71	470KΩ	½	510184	BTS-470K	
R72	330KΩ	½	510181	BTS-330K	
R73	8200Ω	½	510153	BTS-8200	

RESISTORS (cont)

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Stewart-Warner PART No.	IRC PART No.	NOTES
R74	2.2Meg	½	510193	BTS-2.2Meg	
R75	390Ω	½	510129	BTS-390	
R76	560Ω	½	510132	BTS-560	
R77	560Ω	½	510132	BTS-560	
R78	68KΩ	½	510169	BTS-68K	
R79	120KΩ	½	510174	BTS-120K	Note 3
R80	330KΩ	½	510181	BTS-330K	
R81	150KΩ	½	510175	BTS-150K	
R82	330KΩ	½	510181	BTS-330K	
R83	620KΩ	½	510189	BTS-620K	
R84	100KΩ	½	510172	BTS-100K	
R85	330KΩ	1	510181	BTA-330K	
R86	4700Ω	½	510148	BTS-4700	
R87	150KΩ	½	510175	BTS-150K	
R88	68KΩ	1	510189	BTA-68K	

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Stewart-Warner PART No.	IRC PART No.	NOTES
R89	10KΩ	½	510154	BTS-10K	
R90	10KΩ	½	510154	BTS-10K	
R91	470KΩ	½	510184	BTS-470K	
R92	100Ω	2	510318	BW-2-100	
R93	47KΩ	½	510166	BTS-47K	Note 5
R94	12KΩ	2	510356	BTB-12K	
R95	680Ω	½	510134	BTS-680	
R96	3.3Ω	5	510725		
R97	1Meg	½	510190		Note 6
R98	100KΩ	½	510173	BTS-100K	
R99	100Ω	2	510318		Note 4
R100	100Ω	2	510318		Note 4
R101	600Ω	10	510741	1 3/4-600	
R102	600Ω	10	510779	1 3/4-600	
R103	1500Ω	½	510159	BTS-1500	Note 6
R104	15KΩ	2	510357	BTB-15K	Note 6

* Items R69A, R69B, R69C, C63A, C63B, C63C, C63D are combined in one unit.

Note 1. Chassis not containing letter "B" in series designation use a 15KΩ resistor in this application.

Note 2. Chassis not containing letter "B" in series designation use a 1.2Meg resistor in this application.

Note 3. Chassis not containing letter "C" in series designation use a 100KΩ resistor in this application.

Note 4. Chassis not containing letter "D" in series designation use a 100Ω (5 Watt) resistor in this application. Some models may use a single 50Ω (5 Watt) resistor in this application.

Note 5. Used only when letter " D" is included in series designation.

Note 6. Used only when letter " F" is included in series designation.

Note 7. Chassis not containing letter "F" in series designation use two 3300Ω rdsistors in series in this application.

Note 8. Chassis not containing letter "F" in series designation use a 330KΩ resistor in this application.

Note 9. Chassis containing letter "F" in series designation use a 6800Ω resistor in this application. Chassis not containing letters "F" and "G" in series designation use a 1200Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA: Stewart-Warner PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.
T1	117VAC	660VCT	5VAC	6.3VAC	520951					
	①1.75A	1.90ADC	③3A	②2.8A						
				SEC. 4						
				④.5VCT						
				③3A						

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	DC RESISTANCE SEC.	REPLACEMENT DATA: Stewart-Warner PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	160Ω	980Ω	520980	A-8125	A-3003	T3O-5	A-9TX	20971 ⑤ ①	Vert.Osc.Trans.
T3	392 Ω tap ③ 24Ω	0Ω	521066		RVO-80 ④ ⑤	T7B-1K ⑤ ③	D-19 ⑤ ④	230TK ⑤ ③	Horiz.Output Trans.
	4.5Ω, 170.32Ω tap ⑤ 90Ω		520975	A-8123 ⑤	A-3037 ⑤	T3O-5 ⑤	A-10ZX ⑤	204T2 ① ⑤	Vert.Output Trans.
T5A	16Ω		520943	DY-9A ⑦	MDF-70 ⑦	TY-3 ⑤	Y-17 ⑦	21UD3 ⑦	Horiz.Deflection Coil
B	50Ω								Vert.Deflection Coils

① Drill new mounting holes.
② Connect original terminal 7 to new terminal 8, original terminal 6 to new terminal 7, original terminal 5 to new terminal 5, original terminal 3 to new terminal "T", original terminal 2 to new terminal 3, original terminal 1 to new terminal 1
③ Connect terminal 7 to terminal 8, connect original terminal 7 to new terminal 9, original terminal 6 to new terminal 7 or 8, original 5 to new 5, original 3 to new 4, original 2 to new 3, original 1 to new 1.
④ Connect terminal 7 to terminal 8, connect original 7 to new 9, original 6 to new 7 or 8, original 5 to new 5, original 3 to new terminal "T; original 2 to new 3, original 1 to new 1.
⑤ Drill one new mounting hole.
⑥ Connect as auto trans.
⑦ Remove original horiz. d eflection coil shunt capacitor which is mounted externally to yoke.
⑧ Use original deflection coil network.
⑨ See instruction sheet packed with unit for terminal connections.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	IMPEDANCE SEC.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: Stewart-Warner PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T6	4.3KΩ	3.3Ω	450Ω	.9Ω	509376	A-3877	A-2320	RO-8	S-5X	

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA: Stewart-Warner PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	6 x 9"	PM	3.3Ω	508174	ST-810 Mod.P69-T	69A2	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: Stewart-Warner PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coils	0Ω CT	0Ω					
L2	Fil. Choke	0Ω						
L3	Neutr.Coil	0Ω						
L4	RF, Mixer Grid & Osc. Coils	0Ω						
L5	Fil. Choke	0Ω						
L6	RF Choke	0Ω						

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STEWART-WARNER MODELS 21C-9300E, F, G, K, KB, L, LB, M, MB, P, 21T-9300A, AA, B, D, H, HA, R, RB, S, T (Series A thru T)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Stewart-Warner PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L7	1st. Video IF	1Ω						
L8	RF Choke	1.2Ω						
L9	2nd. Video IF	.3Ω	.4Ω	520977	17-1063		6249	Less slug, slug part #507357
L10	3rd. Video IF	.3Ω	.4Ω	520977	17-1064		6250	Less slug, slug part #507357
L11	Fil. Choke	0Ω		507584			4604	1.5 Microhenries
L12	4th. Video IF	.4Ω	.6Ω	520979	17-1064		6250	Less slug, slug part #507357
L13	Series Peaking Coil	8Ω		520620	19-3180	TV-184	6180	180 Microhenries
L14	Shunt Peaking Coil	20Ω		520985	19-3660		4650	650 Microhenries
L15	4.5MC Trap	1.7Ω		509603	20-1004	TV-151	1470	Includes slug, slug part #507357, Stewart Warner part no. includes C41.
L16	Series Peaking Coil	7Ω		520984	19-3160	TV-184	4644	160 Microhenries
L17	Shunt Peaking Coil	22Ω		520986	19-3660		4650	660 Microhenries
L18	Sound IF	.9Ω		509378			1470A	
L19	Ratio Det.	3.6Ω	1Ω CT	509706		TV-115 *	6205 *	Tertiary winding -.4Ω
L20	Horiz. Osc.	75Ω		520943	20-1402	TV-162	6183	Less slug, slug part #521064, tapped @ 55Ω, Horiz. waveform winding -40Ω

* Use adaptor plate

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	Stewart-Warner PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
L21	.190ADC	73Ω	2.9 Hy.	508341	C-2325	C-2991 ①	TR-3300 ①	

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Stewart-Warner PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	5A @ 250V	520988	520989	312005	357002	MTH5	4408
M2	3AG	1/4A @ 250V	508713	520989	312.250	357002	AGC 1/4	4408

MISCELLANEOUS

ITEM No.	PART NAME	Stewart-Warner PART No.	NOTES
M3	Dial Light	118921	Type #47
M4	RF Tuner		
M5	Crystal Diode	509386	Detector
M6	Switch	520563	Phono-TV Selector
M7A	Centering Magnet	521267	(Included with back cover of yoke)
B	Centering Magnet	520987	Strap Type
M8	Ion Trap Magnet	521183	
B3,B4	Trimmer Cap.		Dual 10-160MMF (Horiz. Range), 10-160MMF (Horiz. Drive)
	Cabinet	521108-A	Model 21T-9300A
	Cabinet	521100-B	Model 21T-9300B
	Cabinet	521100-A	Model 21T-9300D
	Cabinet	521108-B	Model 21T-9300H
	Cabinet	521056-A	Model 21C-9300E
	Cabinet	521105-A	Model 21C-9300F
	Cabinet	521105-B	Model 21C-9300G
	Cabinet Back	115324	Models 21C-9300F, 21C-9300G (Includes power cord)
	Cabinet Back	115325	Models 21T-9300A, 21T-9300B, 21T-9300D, 21C-9300E, 21T-9300H (Includes power cord)
	Safety Glass	520494	Models 21T-3900A, 21C-9300E and 21T-9300H
	Safety Glass	520937	Models 21T-9300B, 21T-9300D, 21C-9300F and 21C-9300G
	Mask	521102	(Pix Tube) Models 21T-9300B, 21T-9300D, 21T-9300F, 21T-9300G
	Mask	521133A	(Pix tube) Models 21T-9300A, 21T-9300E, 21T-9300H
	Knob	509017	Fine tuning
	Knob	509019	Brightness
	Knob	520740-B	Tone or power boost (maroon)
	Knob	520831	Off/On Volume (maroon)
	Knob	521134	Horiz. Hold or Vert. Hold
	Knob	521174	Channel Selector (maroon)
	Casters	520492	For cabinets (Models 21C-9300E, 21C-9300F, 21C-9300G
	Escutcheon	520688-A	Name & control panel (plastic)

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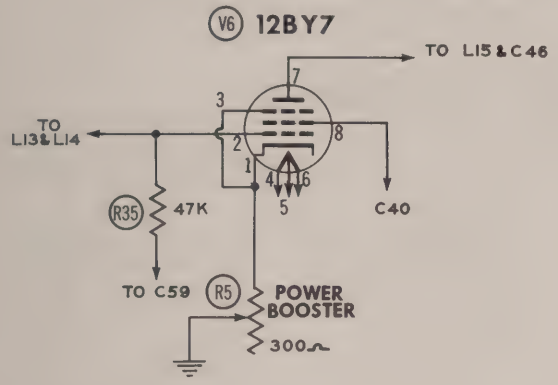
CODE "K"

The following change was made to provide for the use of an alternate type tube.

1. Change V6 (Video Output) from a 6CL6 to a 12BY7. (See circuit below).



CODE "L"

The following change was made to improve focus.

1. Disconnect Pin 6 (focusing grid) of V19 (picture tube) from ground and connect to 270 volt line.

CODE "M"

The following changes were made to meet U.L. requirements.

1. Remove capacitor C86 and C87.
2. Add a 150KΩ resistor to switch leg of AC input.

CODE "N"

Chassis having this change does not have a phono switch or phono input socket.

CODE "P"

The following changes were made to improve picture quality.

1. Change resistor R31 in plate circuit of V4 (2nd. Video IF) from 15KΩ to 5.6KΩ.
2. See alignment instructions on pages 6 and 7 for alignment frequencies of 1st., 2nd., 3rd. and 4th. Video IF's.

CODE "Q"

The following changes were made to extend the range of the Horizontal Hold Control.

1. Change the Horizontal Range Control, B3, from a variable (10-160MMF) capacitor to a fixed 47MMF capacitor.
2. Change R81, in the grid circuit of V14, from 150KΩ to 220KΩ.
3. Change R80, in the grid circuit of V14, from 330KΩ to 1Meg.
4. Add a 150KΩ resistor from the junction of C70 and R80 to ground.
5. Remove R90 from the grid circuit of V15 and replace it with a 270MMF capacitor.
6. Change R61, in the grid circuit of V11, from 820KΩ to 1.5Meg.
7. The value of the plate load resistor, R67, for V12 varies with different chassis series. Before making the changes below check the chassis series type and make only the applicable portion.

a. In chassis which incorporate the letter "J" in the chassis series. Change R67 from 10KΩ to two 4.7KΩ resistors, connected in series. R68 remains connected to the plate (pin 6) of V12 (12AU7) and C68 is reconnected to to the junction of the two 4.7KΩ resistors.

CODE "Q" (Con't)

b. In chassis which incorporate the letter "F" but do not include the letter "J" in the series designation make the following changes. Change R67 from 6.8KΩ to two 3.3KΩ resistors, connected in series. R68 remains connected to the plate (Pin 6) of V12 (12AT7) and C68 is reconnected to the junction of the two 3.3KΩ resistors.

c. In chassis which do not include the letters "F" or "J" in the chassis designation the changes in this step should be omitted when making the "Q" change.

In addition to the above, the procedure given in the horizontal sweep circuit adjustments on page 20 for chassis incorporating the "Q" changes must be performed.

The following changes were made to improve the horizontal retrace blanking. A 150KΩ resistor and a 56KΩ resistor, connected in series, are added from the Cathode (Pin 8) of V15 to ground. A 1Meg resistor is connected from the junction of these two resistors to terminal 1 of the horizontal output transformer. A 100 MMF capacitor is added from the junction of the 150KΩ resistor and 56KΩ resistor to Pin 2 (grid) of the picture tube.

The following changes were made to reduce the picture tube illumination with the brightness control set at minimum. Change R43 from 470KΩ to 330KΩ.

The following change was made to prevent the AGC voltage from going positive. Connect a lead from the junction of R45, R47 and C45 to the unused diode (Pin 6) of V9B (6T8).

CODE "R"

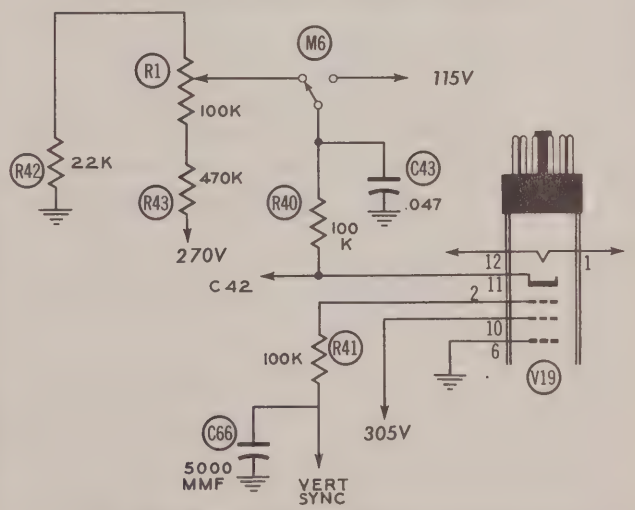
The following change was made to minimize frequency drift in the syncroguide circuit.

1. Change capacitor C76 from .01MFD to .01MFD special (Steward-Warner part number 512311 only)

CODE "S"

The following changes were made to improve the range of the Power Booster.

1. Change connection of Brightness control (R1) from the pin 11 (cathode) of V19 (Picture tube) to pin 2 (grid) of V19. The brightness control circuit for chassis that do not incorporate the letter "S" is shown below.



2. Add a 470KΩ resistor, in parallel with capacitor C42, in cathode circuit of V19 (Picture tube).
3. Change resistor R41 in Plate circuit of V12 from 100KΩ to 47KΩ and add a .1MFD capacitor in series with resistor R41. Connect other end of the 1MFD capacitor to the junction of capacitor C65 and R73.

CODE "T"

The following changes were made to improve the video response.

1. Change series peaking coil L16, in plate circuit of V6 (Video Output), from part #520984 to 520689.
2. Change resistor R37, in parallel with L16 from 15KΩ to 12KΩ.

CODE "T" (Con't)

3. Change Shunt peaking coil L17, in plate circuit of V6, from Part # 520986 to 509342.
4. Change resistor R38, in plate circuit of V6, from 3. 9KΩ to 2. 2KΩ.
5. Change resistor R39, in plate circuit of V6, from 1. 5KΩ to 1. 8KΩ.

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

(For chassis that include series "Q" change)

1. Same as step 1 above.
2. Same as step 2 above.
3. Set horizontal drive control ½ turn from maximum clockwise position.
4. Set horizontal hold control to its maximum clockwise position.
5. Same as step 5 above.
6. Same as step 6 above.
7. Same as step 7 above.
8. Set horizontal hold control counter clockwise and adjust B1 until picture locks in and remains in sync when switching off channel. Turn B1 slowly counter clockwise until picture just begins to lose sync .
9. Same as step 9 above.

Adjust the horizontal drive trimmer (B4) counter clockwise as far as possible without the presence of vertical white lines or compression near the center of the picture.

As the setting of B4 affects the width and linearity of the picture it may be necessary to readjust B1 slightly while adjusting the width control.

(For chassis that do not include series "Q" change)

Turn the set on and tune in a TV station, preferably a test pattern.

Preset the adjustments as follows:

1. Set the horizontal frequency slug (B1) and the stabilizing coil (B2) at their maximum counter-clockwise positions.
2. Short together terminals "C" and "D" of horizontal oscillator, L20.
3. Set horizontal range (B3) to its maximum clockwise position.
4. Set horizontal hold control to its maximum counter clockwise position.
5. Adjust B1 clockwise until picture just locks in horizontally.
6. Remove short from terminals "C" and "D" of L20. If picture loses sync with short removed adjust B2 clockwise until picture falls into sync.
7. Connect the vertical input lead of an oscilloscope to terminal "C" of L20. Adjust the stabilizing coil, B2, clockwise until the broad and narrow peaks are of equal amplitude as shown in Fig. 7. While adjusting B2 keep the picture in sync by turning the horizontal hold control clockwise. Disconnect scope from receiver.
8. Set the horizontal hold control clockwise and adjust B1 until picture locks in and remains in sync when switching off channel. Turn B1 slowly counter-clockwise until picture just begins to lose sync.
9. The horizontal holding action should now be as follows:
   a. With horizontal hold control fully counter clockwise switch off channel and back. The picture should be out of sync or just pulling out of sync.
   b. With horizontal hold control fully clockwise the picture may lose sync when switching off channel and back.
   c. With the horizontal hold control at mid-position the picture should fall in sync when switching off channel and back.

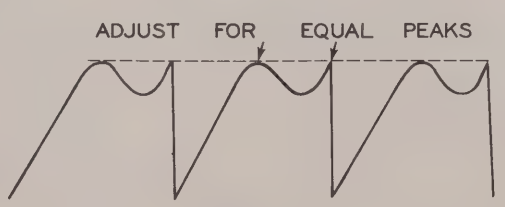


FIG. 7

TROUBLE SHOOTING AIDS (cont)

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POWER

DEAD SET

If filaments fail to light, Check fuse M1, AC interlock assembly and T1. If filaments light check V18 and components that form the B+ filter and decoupling network.

SMALL AND / OR DIM RASTER WITH WEAK SOUND

Substitute V18. Check B+ filter and decoupling network components.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check fuse M2. Check by substitution V14, V15, V16 and V17. Check waveform W17.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C84, R96, R97 and other associated circuit components.	Check C76, C77, C78, L20 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V14, V15, V16, V17 and V18. Check picture tube and other associated components. Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V14, V15, V16, V17 and V18. Check R96, R97, C84, T3, T5A, picture tube and other associated circuit components.

GENERAL

RASTER SOUND NO PIX

See "Loss of Video".

RASTER NO SOUND NO PIX

Check by substitution V1, V2, V3, V4, V5, V6 and V7. Check video detector assembly and other associated circuit components.

NO RASTER NO SOUND

See "Dead Set".

TOTAL LOSS OF SYNC

Substitute V11 and V12. Check associated circuit components especially all sync coupling capacitors and plate load resistors.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this receiving equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the RF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, through the small hole in the cabinet to the right of the channel selector shaft.

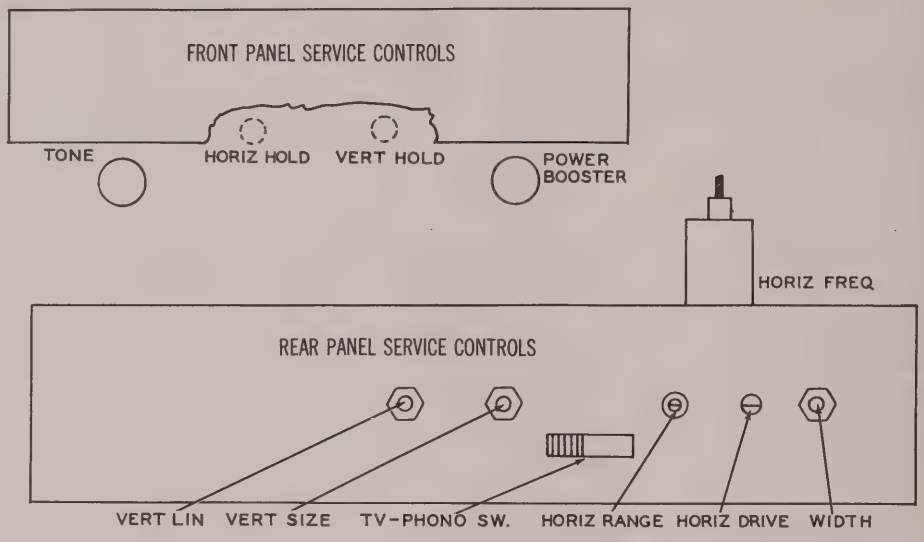
PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the horizontal hold control at the center of its range and adjust the horizontal oscillator slug (L20) until picture synchronizes horizontally. (For location, see tube placement chart).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L19) located on top of chassis. (See tube placement chart).

FUSES

Two fuses are used. One for horizontal sweep circuit protection and on eof LV power supply protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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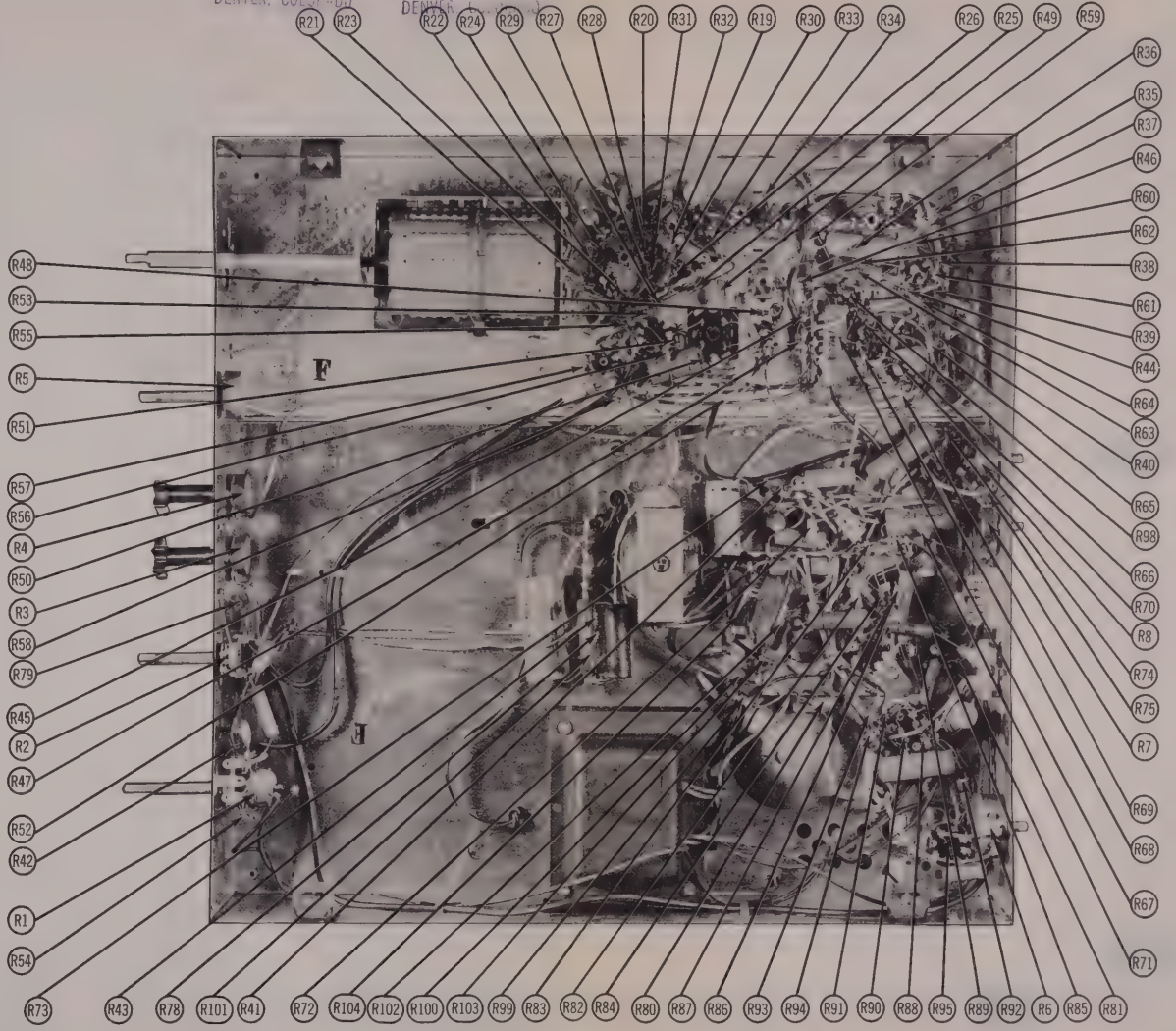

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PHILCO MODEL B710

PROPERTY OF
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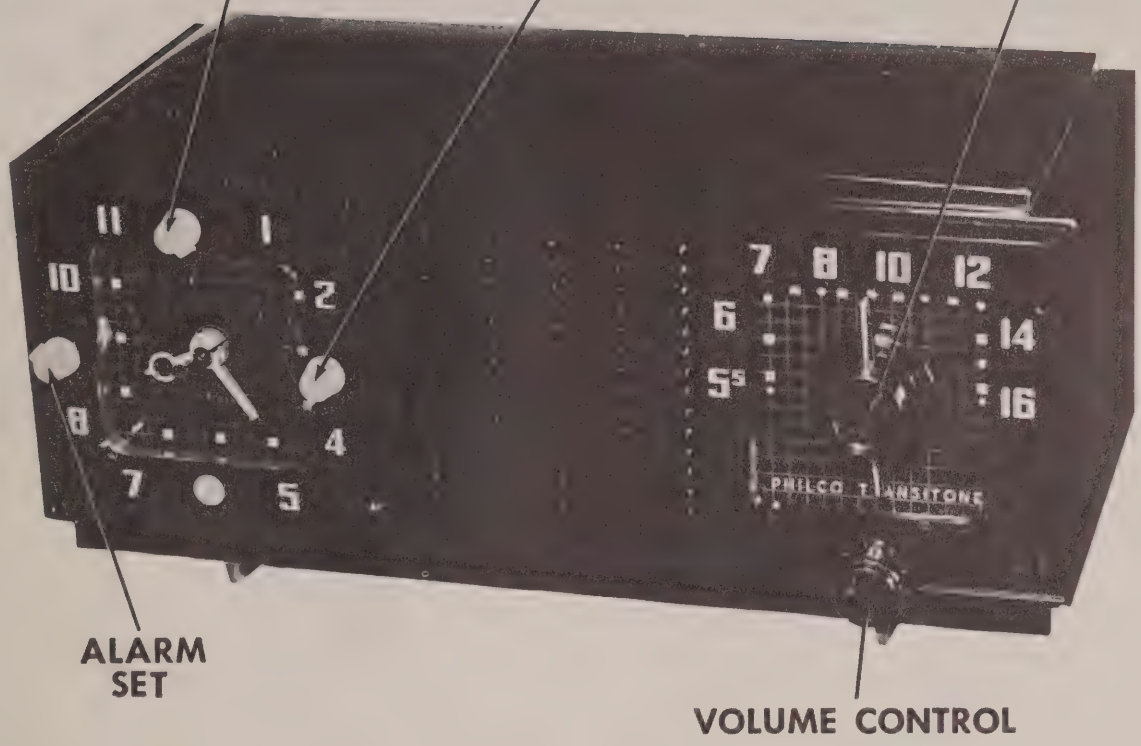
3924 MEADE ST.
DENVER, COLORADO

PHILCO MODEL B710



PHILCO MODEL B710

TRADE NAME	Philco Model B710
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	AC Operated AM Superheterodyne Receiver with Electric Clock
TUBES (Five)	Types 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 35C5 Audio Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts -60 Cycles — RATING .23 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. Attenuate signal generator to maintain 1.25 volts on VTVM.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to B-.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	Tune to 1500KC signal	"	A6	"

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PARTS LIST AND DESCRIPTIONS

PHILCO MODEL B710

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amplifier	12BA6	12BA6	7BK	
V3	Det-AVC-AF Amp	12AV6	12AV6	7BT	
V4	Audio Output	35C5	35C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	30	150	45-3037	PRS150/30-30 -30				3N534		Orange
B	25	150								Red
C	20	150								Blue
C2	.05	200	30-4650-45	P288-05	DF-503	PJ2S5		PT415	2TM-S5	
C3	47		30-1230-4	SI47	D6-470		GP1K-470	UC-5447	5GA-Q47	
C4	7.5		30-1224-83						5GA-V75	
C5	.05	200	30-4650-45	P288-05	DF-503	PJ2S5		PT415	2TM-S5	
C6	5000		30-1238-1	BPD-005	MD-502	TM5D5	811-005	DC-525	5HK-D5	
C7A	5000		*30-6001	*PA-112-1	*PC-70		*1406-01		*104C4	
B	250									
C										
C8	.022	400	30-4650-43	P488-022	DD-203	PTE4S22		PT4122	4TM-S22	
C9	.047	400	30-4650-45	489ZX-047		PJ4S5		PT4147	4TM-S47	
C10	.2	400	30-4650-49	P488-2				PT402	4TM-P22	

* Items C7A, C7B, C7C, R7A, R7B are combined in one unit.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	33-5565	Q13-133	AG-60-Z	B-60	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R2	22KΩ	½	66-3228340	BTS-22K	
R3	4700Ω	½	66-2478340	BTS-4700	
R4	2.2Meg	½	66-5228340	BTS-2.2Meg	
R5	47KΩ	½	66-3478340	BTS-47K	
R6	10Meg	½	66-6108340	BTS-10Meg	

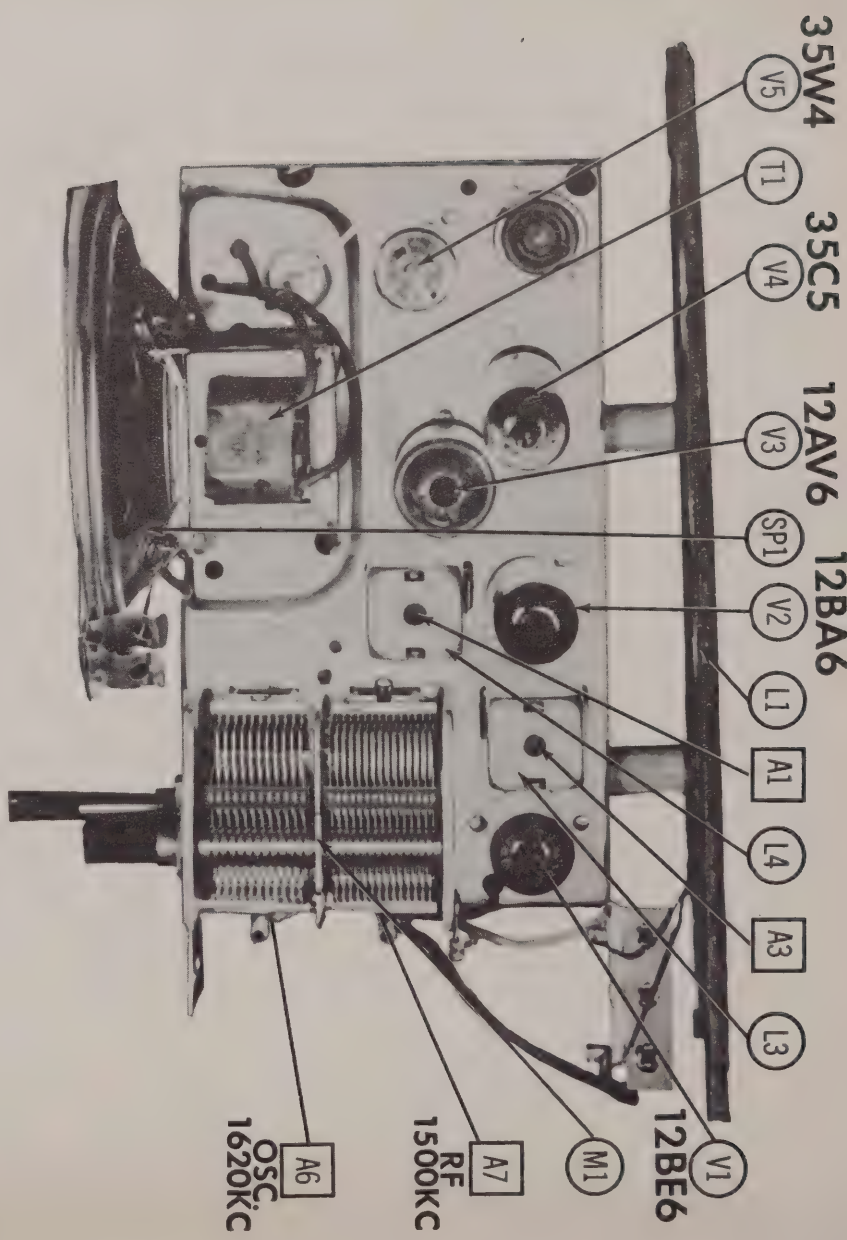
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R7A	500KΩ	♦	♦30-6001		
B	500KΩ	♦			
R8	150Ω	½	66-1158340	BTS-150	
R9	220Ω	1	66-1224340	BTA-220	
R10	1000Ω	½	66-2108340	BTS-1000	
R11	*	*	33-1343-3		

* Special resistor - 100Ω Hot, 880Ω Cold.
♦ Items R7A, R7B, C7A, C7B, C7C are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2KΩ	3.4Ω	234Ω	.92Ω	Part of Spkr.	A-3332 ①	A-3025 ①	RO-2 ①	S-2X ①	① Bend mounting tabs down, file out slots, mount on original mounting bracket.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	PHILCO PART No.	JENSEN PART No.	QUAM PART No.	
SP1	4"	PM	3.4Ω	36-1627-23	ST-113 Mod. P4-X	4A07	

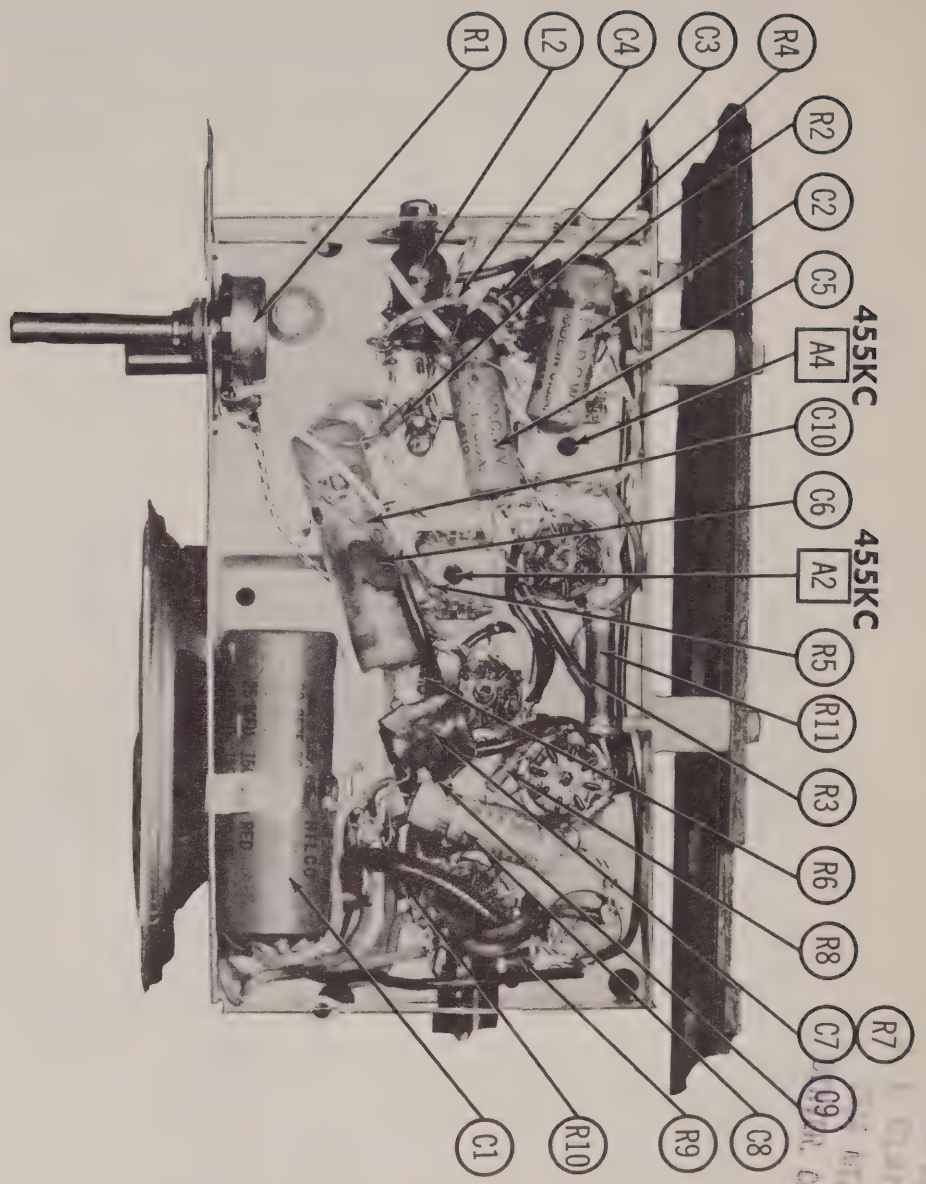
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	2.9Ω		76-7757-3				Includes cabinet back
L2	Osc. Coil	1Ω	6.5Ω	33-4453-6			71-Osc.	
L3	Input IF	15Ω	15Ω	32-4161A	16-6758	BC-352	12-C1	
L4	Output IF	15Ω	15Ω	32-4240A	16-6770	BC-355	12-C6	

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M1	Tuning Cap.	31-2751-13	(32-495MMF, 20-170MMF)
	Cabinet	10924-11	
	Knob	54-4983-6	Clock (3 used)
	Knob	54-4978-5	Station tuning
	Knob	54-4815-8	Volume
	Clock	41-2041-4	
	Back	76-7757-3	Includes antenna loop
	Glass	54-4977-5	Radio dial

CHASSIS—BOTTOM VIEW



PHILCO MODEL B710

CITY OF
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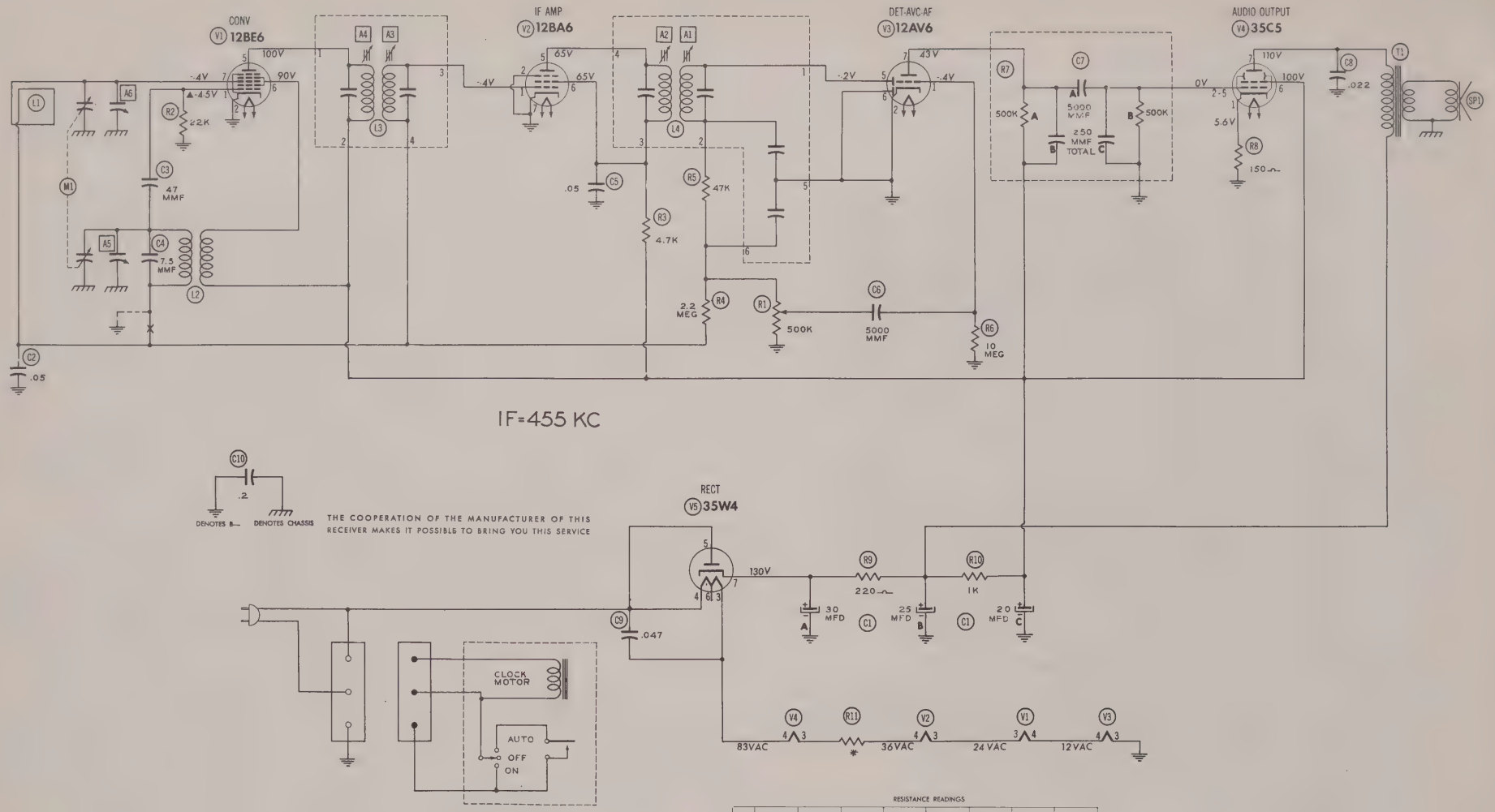
COLORADO

PHILCO MODEL B710



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	0Ω	34Ω	20Ω	†1.2KΩ	†1.2KΩ	2.7Meg
V 2	12BA6	2.7Meg	0Ω	34Ω	54Ω	†5.9KΩ	†5.9KΩ	0Ω
V 3	12AV6	10Meg	0Ω	0Ω	17Ω	550KΩ	0Ω	†500KΩ
V 4	35C5	150Ω	500KΩ	500Ω	525Ω	500KΩ	†1.2KΩ	†450Ω
V 5	35W4	70KΩ	70KΩ	525Ω	550Ω	550Ω	550Ω	70KΩ

▲ TAKEN WITH VACUUM TUBE VOLTMETER
† MEASURED FROM PIN 7 OF V5.

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PROPERTY OF
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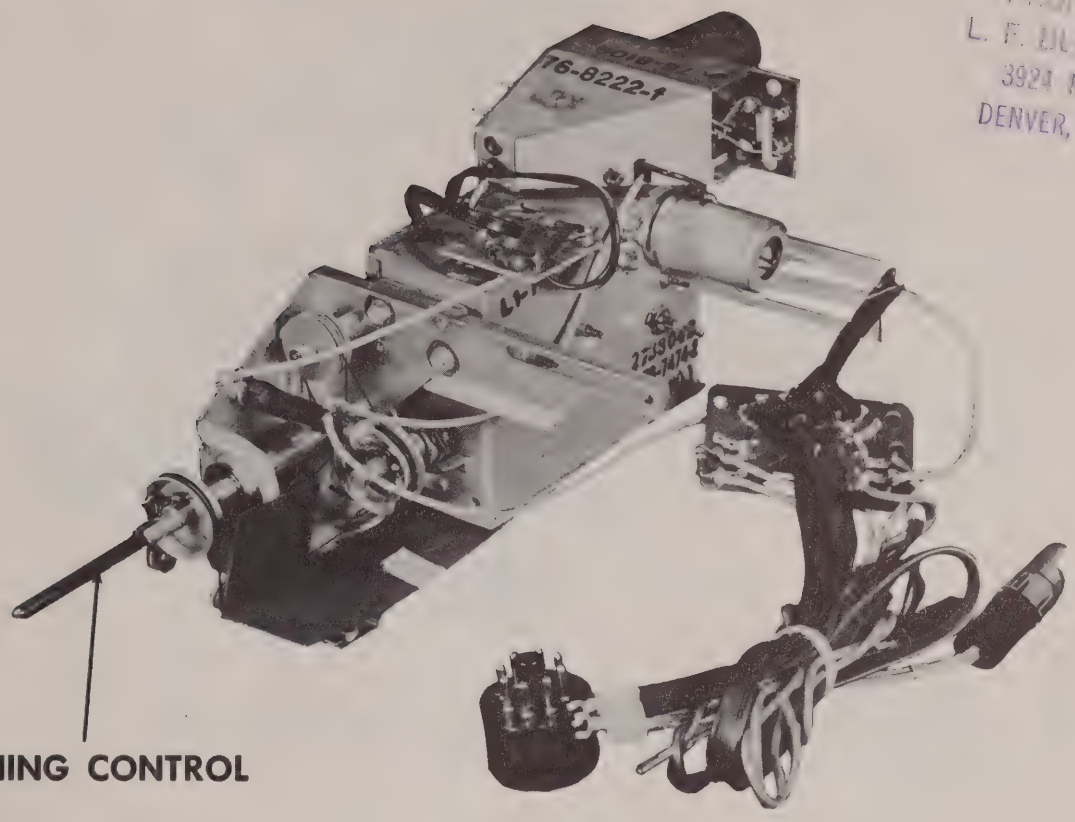
DENVER, COLORADO

PHILCO
MODELS UT-21A, B (UHF Tuner)



TUNING CONTROL

PHILCO
MODELS UT-21A, B (UHF Tuner)

TRADE NAME	Philco Models UT-21A, UT-21B
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	UHF Tuner Adapter
TUBES (Two)	Types 6AF4 UHF Osc., 6BQ7A Pre-Amp.
POWER SUPPLY	Supplied from VHF TV Receiver
TUNING RANGE	Channels 14 thru 83

THIS UHF TUNER HAS BEEN PROPERLY ALIGNED AT THE FACTORY AND IS VERY STABLE. ALIGNMENT SHOULD NOT BE ATTEMPTED IN THE FIELD.

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PARTS LIST AND DESCRIPTIONS

PHILCO MODEL UT-21A

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V1	UHF Oscillator	6HF4	6AF4	7DK	
V2	Pre-Amplifier	6BQ7A	6BQ7A	9AJ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1	680			SI680	D6-681		GP2K-681	UC-5368	5GA-T68	Note 1
C2	680			SI680	D6-681		GP2K-681	UC-5368	5GA-T68	Note 1
C3	470		62-147001011	SI470	D6-471		GP2K-471	UC-5347	5GA-T47	
C4	8		30-1224-46				NP0K-080			
C5	470		62-147001011	SI470	D6-471		GP2K-471	UC-5347	5GA-T47	
C6	470		62-147001011	SI470	D6-471		GP2K-471	UC-5347	5GA-T47	
C7	470		62-147001011	SI470	D6-471		GP2K-471	UC-5347	5GA-T47	
C8	2.2		30-1221-6	SI2.2NP0	TCZ-2.2		NP0K-2R2		5TCCB-V22	
C9	2-6		31-6520-4		829-6			CT552		
C10	470		62-147001011	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C11	470		62-147001011	SI470	D6-471	TM5T5	GP2K-471	UC-5347	5GA-T47	
C12	2-8		31-6527							
C13	15		62-01540901l	SI15N750	TCN-15		N750K-150		5TCU-Q15	
C14	15		62-01540901l	SI15N750	TCN-15		N750K-150		5TCU-Q15	

Note 1. Part of panel filter M11A, part #76-8078.

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R1	10KΩ	10	33-1336-58	1 3/4A-10K	
R2	120Ω	½	66-1128340	BTS-120	
R3	100KΩ	½	66-4108340	BTS-100K	
R4	1500Ω	½	66-2158340	BTS-1500	
R5	330Ω	½	66-1338340	BTS-330	

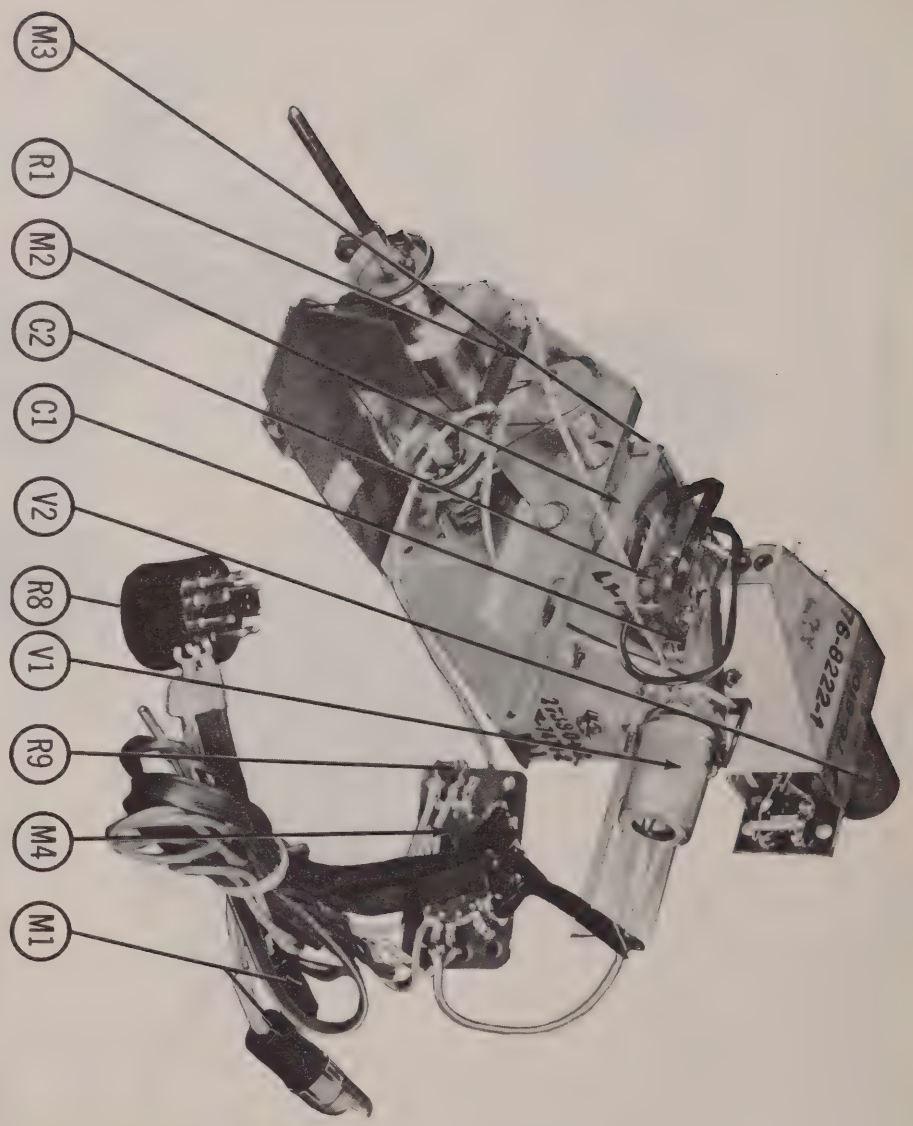
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PHILCO PART No.	IRC PART No.	
R6	1000Ω	½	66-2108340	BTS-1000	
R7	15Ω	½	66-0158340	BTS-15	
R8	10Ω	½	66-0108340	BTS-10	
R9	150KΩ	½	66-4158340	BTS-150K	
R10	3.9Ω	½	66-9898340		Note

Note: Not used in all models.

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	UHF IF Input Tuning Pri.	0Ω		32-4359-14				
L2	UHF IF Input Tuning Secondary	0Ω		32-4578				
L3	Feedback Coil	.7Ω		32-4551-2				
L4	RF Choke	.4Ω		32-4548-13				
L5	UHF IF Input Coil	0Ω	0Ω	32-4575				

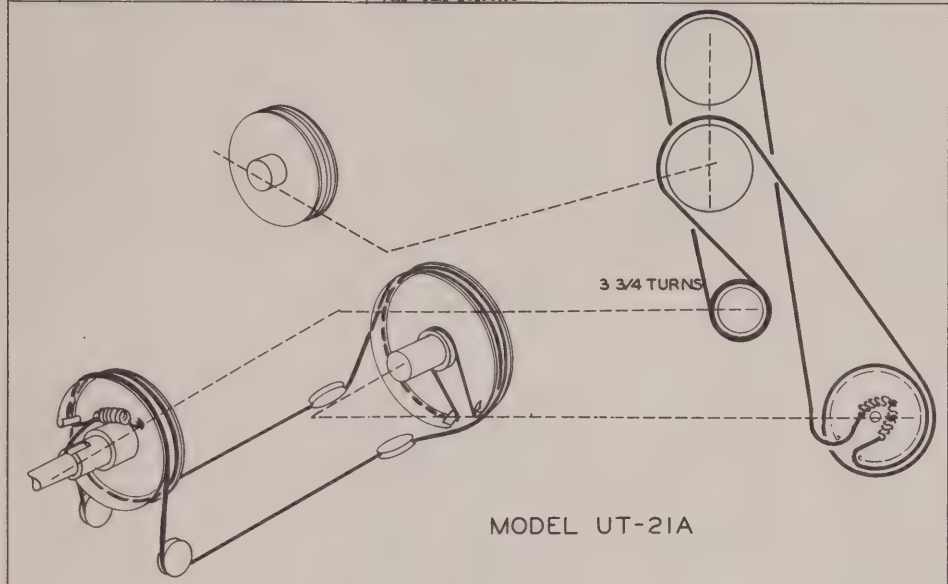
CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

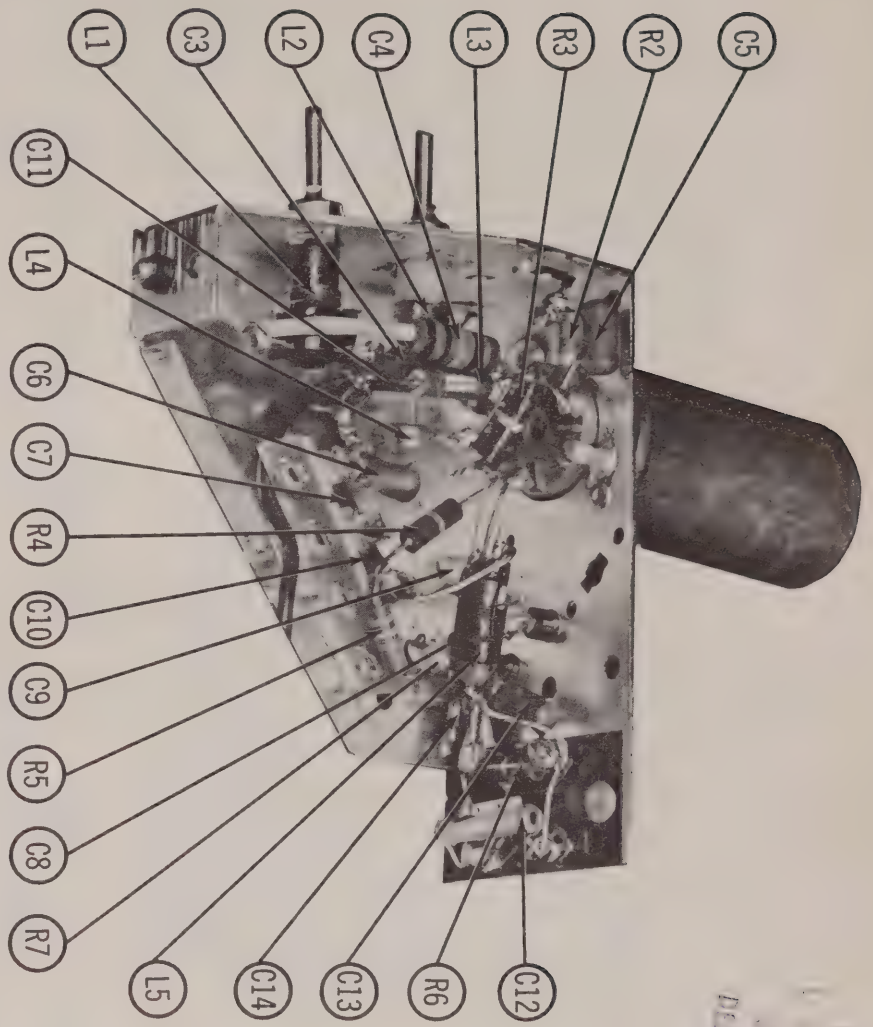
MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M1A	Pilot Lamp	34-2064	UHF Indicator Type #47
B	Pilot Lamp	34-2068	VHF Indicator Type #47
M2	Tuner, Pre-Amp. & Planetary Assy.	76-8222-2	
M3	Crystal Diode	34-8024	UHF Mixer
M4	Switch	42-1996-1	VHF-UHF Selector



DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW



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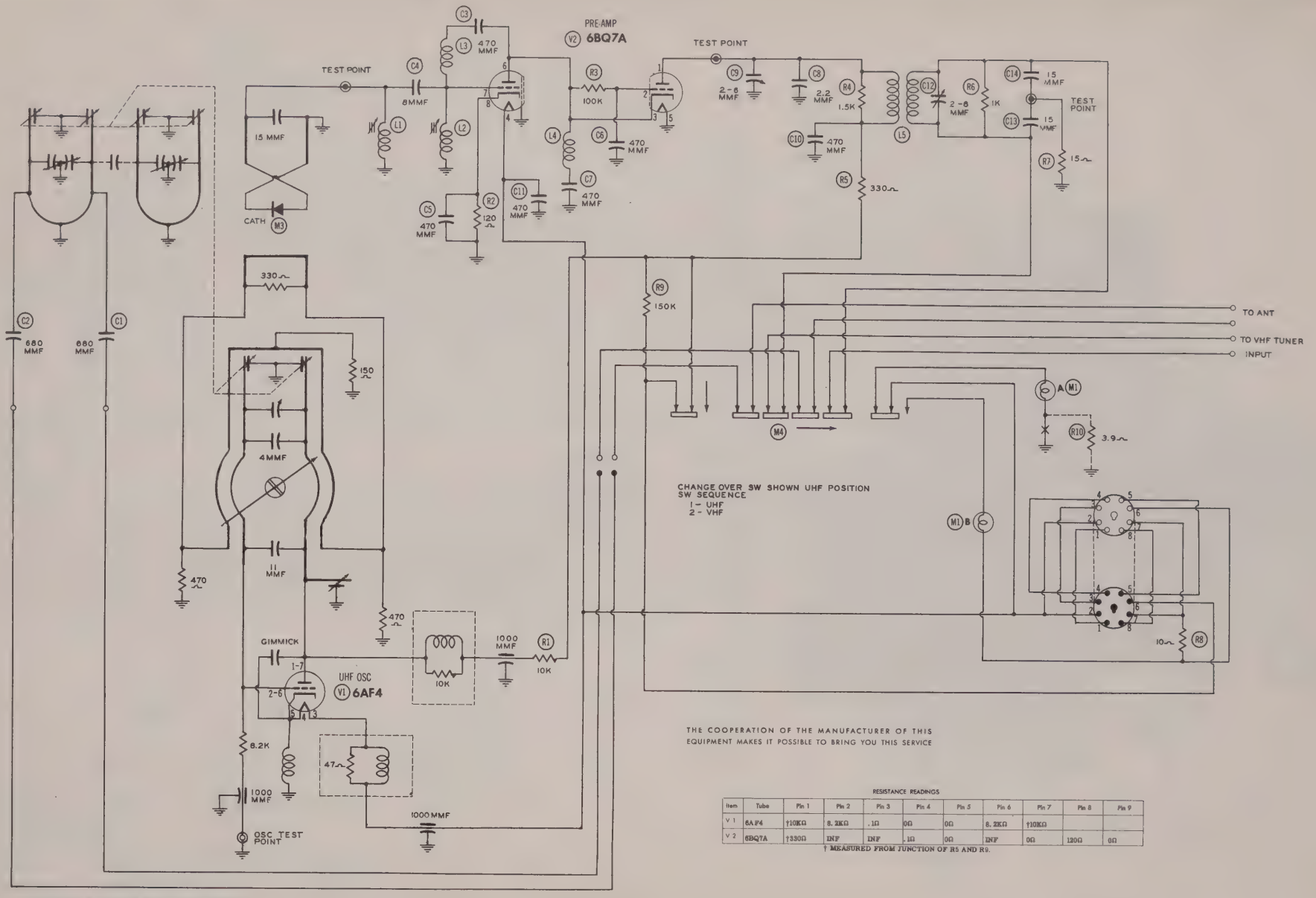
PHILCO MODEL UT-21A



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4	†10KΩ	8.2KΩ	.1Ω	0Ω	0Ω	8.2KΩ	†10KΩ		
V 2	6BQ7A	†330Ω	INF	INF	.1Ω	0Ω	INF	0Ω	120Ω	0Ω

† MEASURED FROM JUNCTION OF R5 AND R9.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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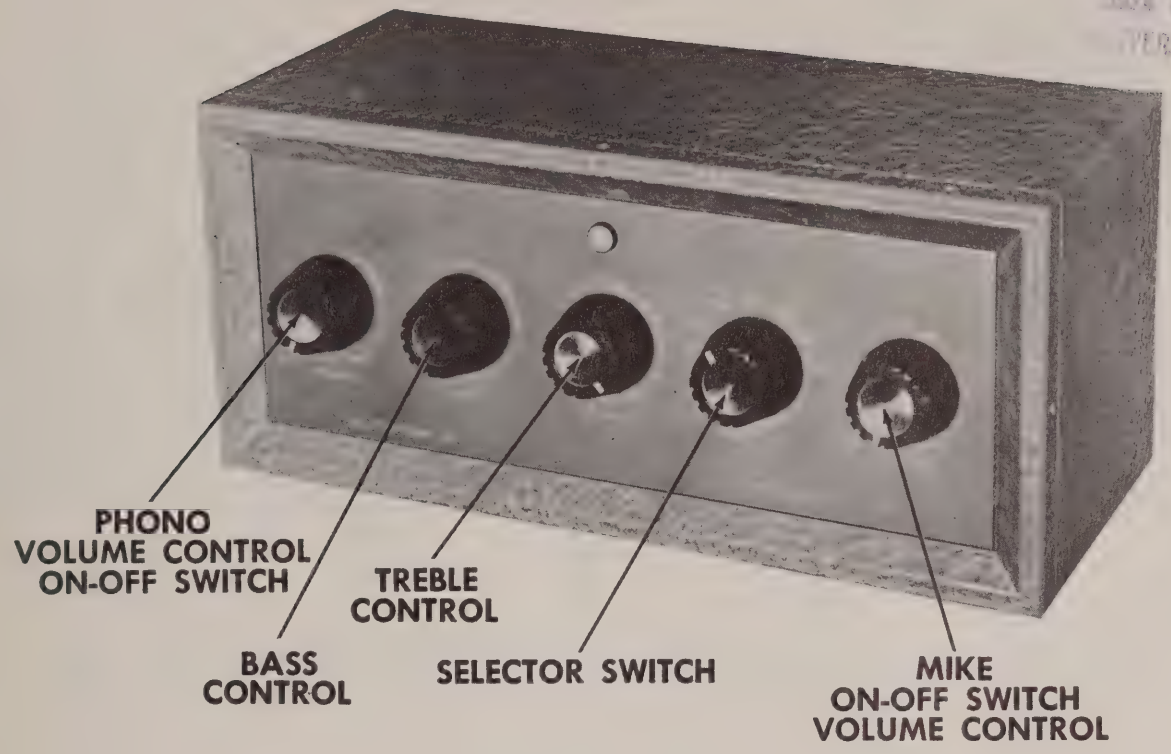
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of + 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

PROPERTY OF
L. E. BLANKENSHIP
3004 MEADE ST.
DENVER, COLORADO

PILOT
MODEL PA-912



PILOT
MODEL PA-912

TRADE NAME	Pilot Model PA-912
MANUFACTURER	Pilot Radio Corp., 37-06 36th St., Long Island City, N.Y.
TYPE SET	AC Operated 7 Channel Pre-Amplifier
TUBES (Four)	Types 12AX7 Phono Pre-amp.-Mic Pre-amp., 12AX7 Phono Amp.-Mixer Amp., 12AT7 AF Amp.-Cathode Follower, 6X4 Rectiifer
POWER SUPPLY	105-120 Volts AC-60 Cycles RATING .15 Amp. @ 117 Volts AC

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PARTS LIST AND DESCRIPTIONS

PILOT
MODEL PA-912

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		PILOT PART No.	STANDARD REPLACEMENT		
V1	Phono Pre-Amp. Mic Pre-Amplifier	12AX7	12AX7	9A	
V2	Phono Amplifier	12AX7	12AX7	9A	
V3	AF Amplifier Cathode Follower	12AT7	12AT7	9A	
V4	Rectifier	6X4	6X4	5BS	

CAPACITORS

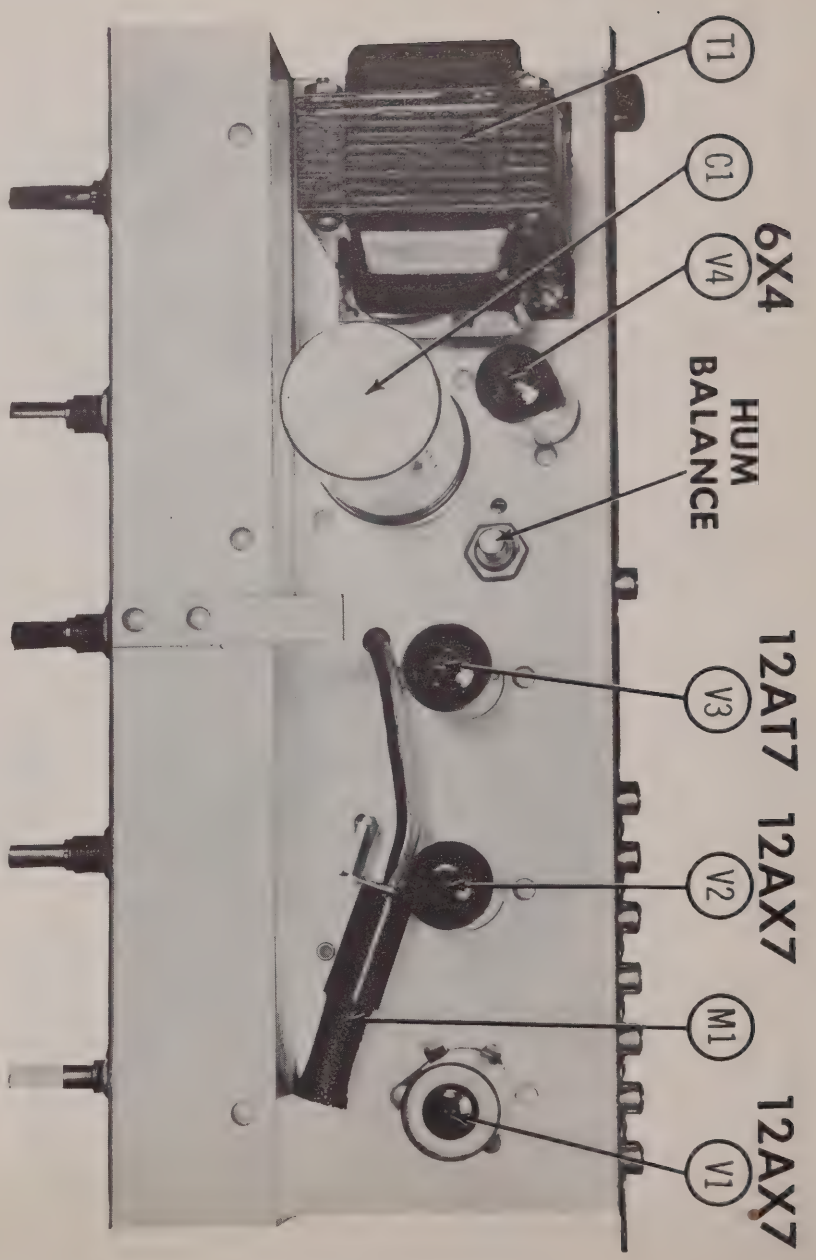
Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PILOT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	▲40	300							R1428	
B	■80	250								
C	▲40	250								
C2	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C3	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C4	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C5	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C6	.005	400								
C7	.033	400								
C8	.022	400								
C9	800			SI800		TM5T8				
C10	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C11	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C12	50			SI50	D6-500	TM5D5	GP1K-500	UC-545	5GA-Q5	
C13	1000			SI1000	D6-102	TM5D1	GP2L-102	UC-521	5GA-D1	
C14	1200			SI1200	D6-122		GP2L-122	UC-5212	5GA-D12	
C15	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C16	2.2			SI2.2NP0	TCZ-2.2				5TCCB-V22	
C17	.047	400		P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C18	.1	400		P488-1	DF-104	PTE4P1		PT401	4TM-P1	
C19	10000			BPD-01	D6-103	TM5S1	811-01	DC-511	5HK-S1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PILOT PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½		Q13-133	AG-60-Z	B-60-S	U-48	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch			76-1	SWB	Not Req.	US-26	Attach to R1A
R2A	5Meg	½		Q13-141	AG-69-Z		U-65	Bass
B	Shaft			Not Req.	FS-3		Not Req.	Attach to R2A
R3A	5Meg	½		Q13-141	AG-69-Z		U-65	Treble
B	Shaft			Not Req.	FS-3		Not Req.	Attach to R3A
R4A	500KΩ	½		Q13-133	AG-60-Z	B-60-S	U-48	Mike Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	Attach to R4A
C	Switch			76-1	SWB	Not Req.	Us-26	Attach to R4A
R5	25K	½					U29	Hum Balance

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PILOT PART No.	IRC PART No.	
R6	3.9Meg	½			Note 1
R7	330KΩ	½		BTS-330K	
R8	82KΩ	½		BTS-82K	
R9	3.9Meg	½			Note 1
R10	15KΩ	½		BTS-15K	
R11	12KΩ	½		BTS-12K	
R12	22KΩ	½		BTS-22K	
R13	68KΩ	½		BTS-68K	
R14	8.2KΩ	½		BTS-8.2K	
R15	270KΩ	½		BTS-270K	
R16	1Meg	½		BTS-1Meg	
R17	100KΩ	½		BTS-100K	
R18	68KΩ	½		BTS-68K	
R19	39KΩ	½		BTS-39K	
R20	82KΩ	½		BTS-82K	
R21	2.2KΩ	½		BTS-2.2K	
R22	39KΩ	1		BTA-39K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	PILOT PART No.	IRC PART No.	
R23	82KΩ	½		BTS-82K	
R24	2.2KΩ	½		BTS-2.2K	
R25	82KΩ	1		BTA-82K	
R26	220KΩ	½		BTS-220K	
R27	4.7KΩ	½		BTS-4.7K	
R28	220KΩ	½		BTS-220K	
R29	100KΩ	½		BTS-100K	
R30	1000Ω	½		BTS-1000	
R31	82KΩ	1		BTA-82K	
R32	1Meg	½		BTS-1Meg	
R33	470Ω	½		BTS-470	
R34	27KΩ	1		BTA-27K	
R35	12KΩ	1		BTA-12K	
R36	220KΩ	½		BTS-220K	
R37	15KΩ	1		BTA-15K	
R38	220KΩ	½		BTS-220K	
R39	39KΩ	½		BTS-39K	
R40	82KΩ	1		BTA-82K	

Note 1. Some Models may use 3.3Meg in this application.

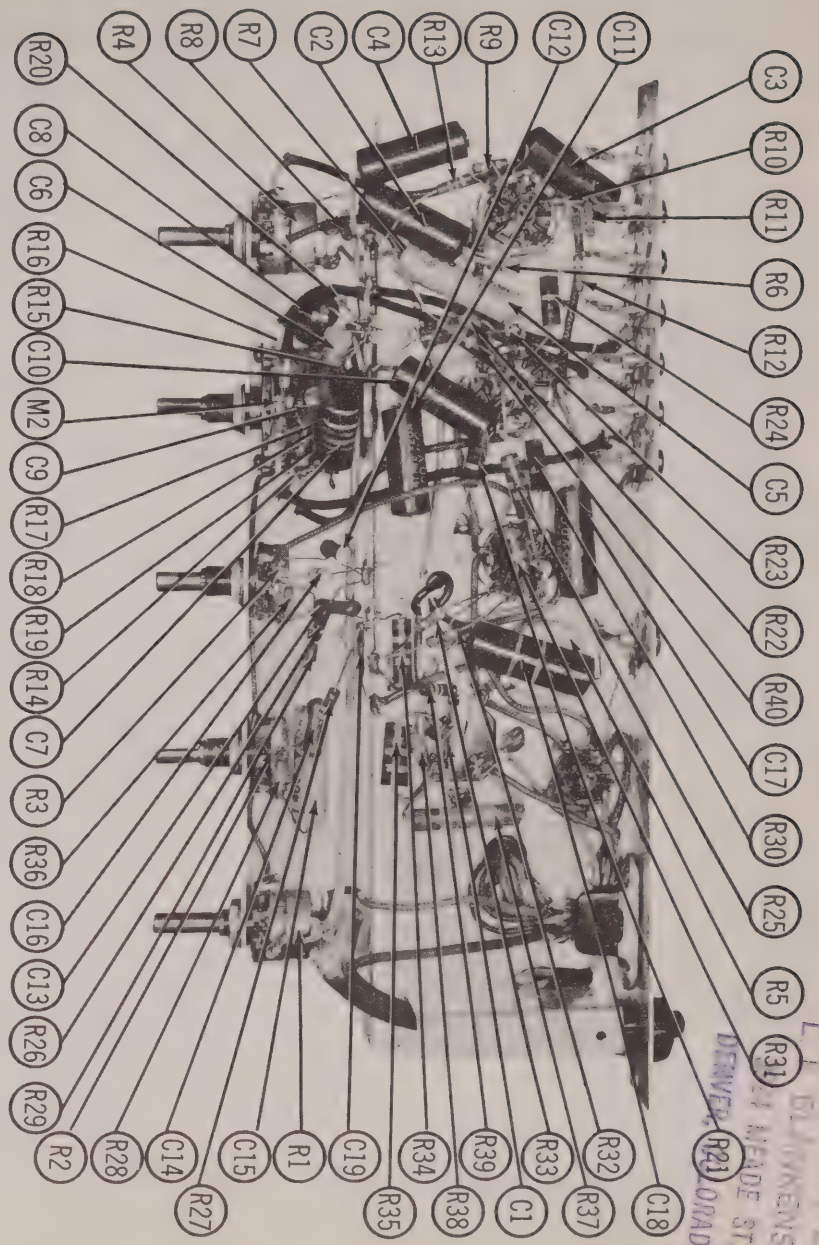
TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA				
	PRI.	SEC. 1	SEC. 2	SEC. 3	PILOT PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.
T1	117VAC @ .15A	380VCT .010ADC	6.3VAC @ 1.6A		55-34				

MISCELLANEOUS

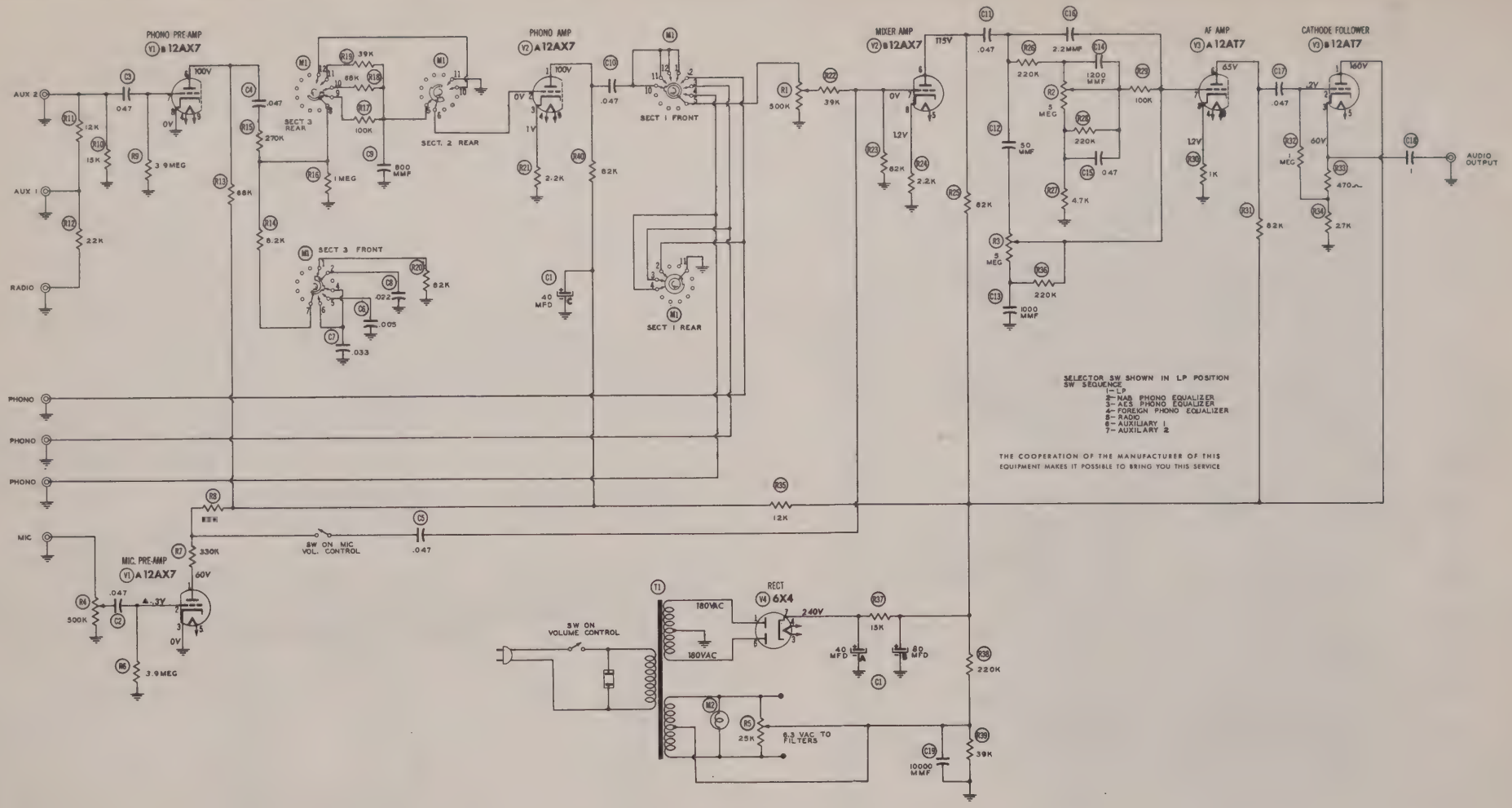
ITEM No.	PART NAME	PILOT PART No.	NOTES
M1	Dial Light		Type #47
M2	Switch		Input Selector-Equalizer

CHASSIS—BOTTOM VIEW



PROPERTY OF
L. J. BLANKENSHIP
2214 MEADE ST.
DENVER, COLORADO

PILOT
MODEL PA-912



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	†425KΩ	3. 9Meg	0Ω	40KΩ	40KΩ	†95KΩ	3. 9Meg	0Ω	40KΩ
V 2	12AX7	†115KΩ	160KΩ	2. 2KΩ	40KΩ	40KΩ	†97KΩ	25KΩ	2. 2KΩ	40KΩ
V 3	12AT7	†15KΩ	1Meg	27KΩ	40KΩ	40KΩ	†97KΩ	100KΩ	1KΩ	40KΩ
V 4	6X4	600Ω	INF	40KΩ	40KΩ	INF	590Ω	40KΩ		

ALL READINGS WITH CONTROLS AT MINIMUM AND M1 IN FULL COUNTER-CLOCKWISE POSITION.
† MEASURED FROM PIN 7 OF V4.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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223-10

1 - DC Voltage measurements are at 20, 000 ohms per volt, AC Voltages measured at 1000 ohms per volt.
2 - Socket connections are shown as bottom views.
3 - Measured values are from socket pin to common negative.
4 - Line voltage maintained at 117 volts for voltage readings.
5 - Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6 - All controls at minimum, proper output load connected.

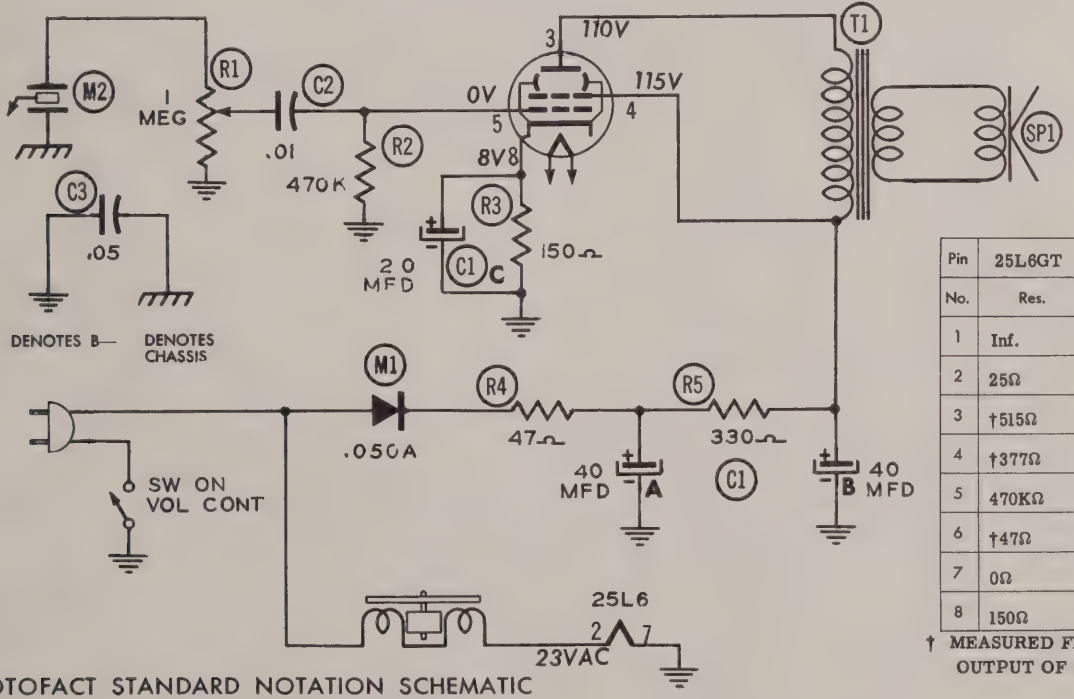
PROPERTY OF
L. F. BLANKENSHIP
3001 MEADE ST
DENVER, COLORADO

STEELMAN
MODEL 151M

TRADE NAME	Steelman Model 151M
MANUFACTURER	Steelman Phono & Radio Co., Inc., 12-30 Anderson Ave., Mt. Vernon, N.Y.
TYPE SET	AC Operated Phono Amplifier with Manual Record Player
TUBES (One)	Type 25L6GT Audio Amplifier
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING .37 Amp. @ 117 Volts AC

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

AUDIO OUTPUT
V1 25L6GT



Pin No.	25L6GT Res.
1	Inf.
2	25Ω
3	†515Ω
4	†377Ω
5	470KΩ
6	†47Ω
7	0Ω
8	150Ω

† MEASURED FROM OUTPUT OF M1.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RTMA BASE TYPE	NOTES
		STEELMAN PART No.	STANDARD REPLACEMENT		
V1	Audio Output	25L6GT	25L6GT	7S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1A	40	150		PRS150/50-30-20		EDL44215		3N532	TVA-3448	Red
B	40	150								Blue
C	20	150								Yellow
C2	.01	600		P688-01	D6-103	PTE6S1	GP2-333-103	PT611	6TM-S1	
C3	.05	400		P488-05	DF-503	PTE4S5		PT415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	STEELMAN PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	1Meg	½	VC-42	Q13-137	AG-63-Z	BSK-70-S	U-53	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	US-26	Attach to R1A

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	STEELMAN PART No.	IRC PART No.	
R2	470KΩ	½		BTS-470K	
R3	150Ω	1		BTA-150	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	STEELMAN PART No.	IRC PART No.	
R4	47Ω	1		BTA-330	
R5	330Ω	1			

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA					NOTES
	IMPEDANCE		DC RES.		STEELMAN PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	
	PRI.	SEC.	PRI.	SEC.						
T1	2.8KΩ	3.4Ω	139Ω	.42Ω		A-3332 ①	A-3025 ①	RO-302 ①	S-1X ①	① Bend mounting tabs down, file out slots, mount on original mounting bracket.

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	STEELMAN PART No.	JENSEN PART No.	QUAM PART No.	
SP1	4"	PM	3.4Ω		ST-113 Mod. P4-X	4A07	

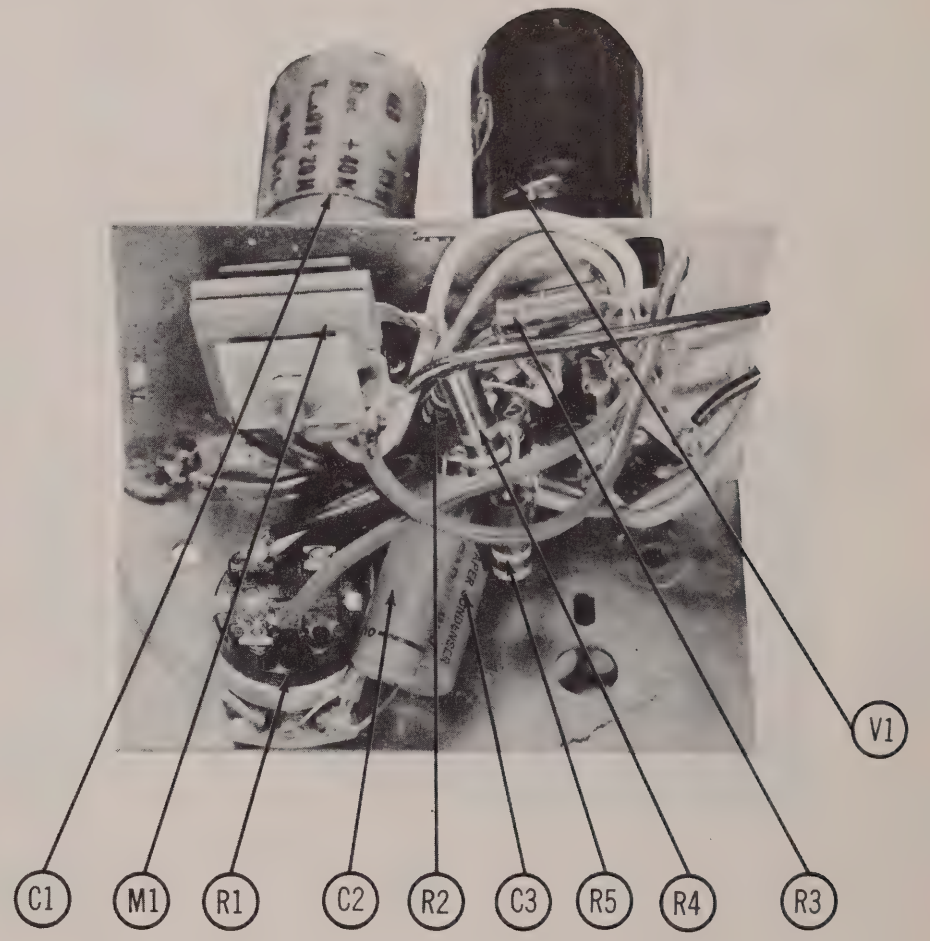
SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA					
	CURRENT	STEELMAN PART No.	SYLVANIA PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.
M1	.050ADC		NA5	8J1	1002A	6S65	65

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA							REMARKS
	STEELMAN PART No.	ASTATIC PART No.		SHURE PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M2				*92H		*24H60		* Complete arm and cartridge Assembly

CHASSIS—BOTTOM VIEW



PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	STEELMAN PART No.	WALCO PART No.	JENSEN PART No.	
M3		WS400	J-10 or NY-153	

PROPERTY OF
L. F. BLANKENSHIP
3830 KINGS ST.
DENVER, COLORADO

TUNING CONTROL

VOLUME CONTROL
ON-OFF SWITCH

TRAVLER
MODEL 5300

TRADE NAME Travler Model 5300
MANUFACTURER Travler Radio & Tel. Corp., 571 W. Jackson Blvd., Chicago, Ill.
TYPE SET Battery Operated Portable AM Superheterodyne Receiver
TUBES (Four) Types 1R5 Conv., 1U4 IF Amp., 1U5 Det.-AVC-AF Amp., 3V4 Audio Output

POWER SUPPLY 1½ Volts "A" Supply & 67½ Volts "B" Supply RATING 250MA @ 1½ Volts DC & 7MA @ 67½ Volts DC
TUNING RANGE—BROADCAST 535-1630KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to antenna stator lug. Low side to chassis.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3	Adjust for maximum deflection.
2.	"	"	1630KC	"	"	A4	"
3.	"	"	535KC	Tuning gang fully closed	"	A5	"
4.	Repeat step 3.						
5.	.1MFD	High side to antenna stator lug. Low side to chassis.	1400KC	Tune to 1400KC signal	Across voice coil	A6	Adjust for maximum deflection.

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PARTS LIST AND DESCRIPTIONS

TRAVLER MODEL 5300

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: TRAVLER PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	Converter	1R5	1R5	7AT	
V2	IF Amplifier	1U4	1U4	6AR	
V3	Det-AVC-AF Amp.	1U5	1U5	6BW	
V4	Audio Output	3V4	3V4	6BX	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: TRAVLER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1	10	70	EC-11	EZ6G108		BBR-1070				
C2	5000		CC-3	BPD-005	MD-502	TM5D5	GP2-333-502	DC-525	5GA-D5	
C3	100		CC-5	BPD-001	D6-101	TM5T1	GP1K-101	UC-531	5GA-T1	
C4A	2000									
B	150									
C	.01				*PC-165					
D	150									
E	5000									
C5	1500		CC-20	SI1500	D6-152	TM5D15	GP2L-152	UC-5215	5GA-D15	

* Items C4A, C4B, C4C, C4D, C4E and R4A, R4B, R4C, R4C , R4D are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRAVLER PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	VC-40	Q13-137	AG-63-Z	B-70-S	U-53	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-2	SWB-2	Not Req.	US-27	Attach to R1A

RESISTORS

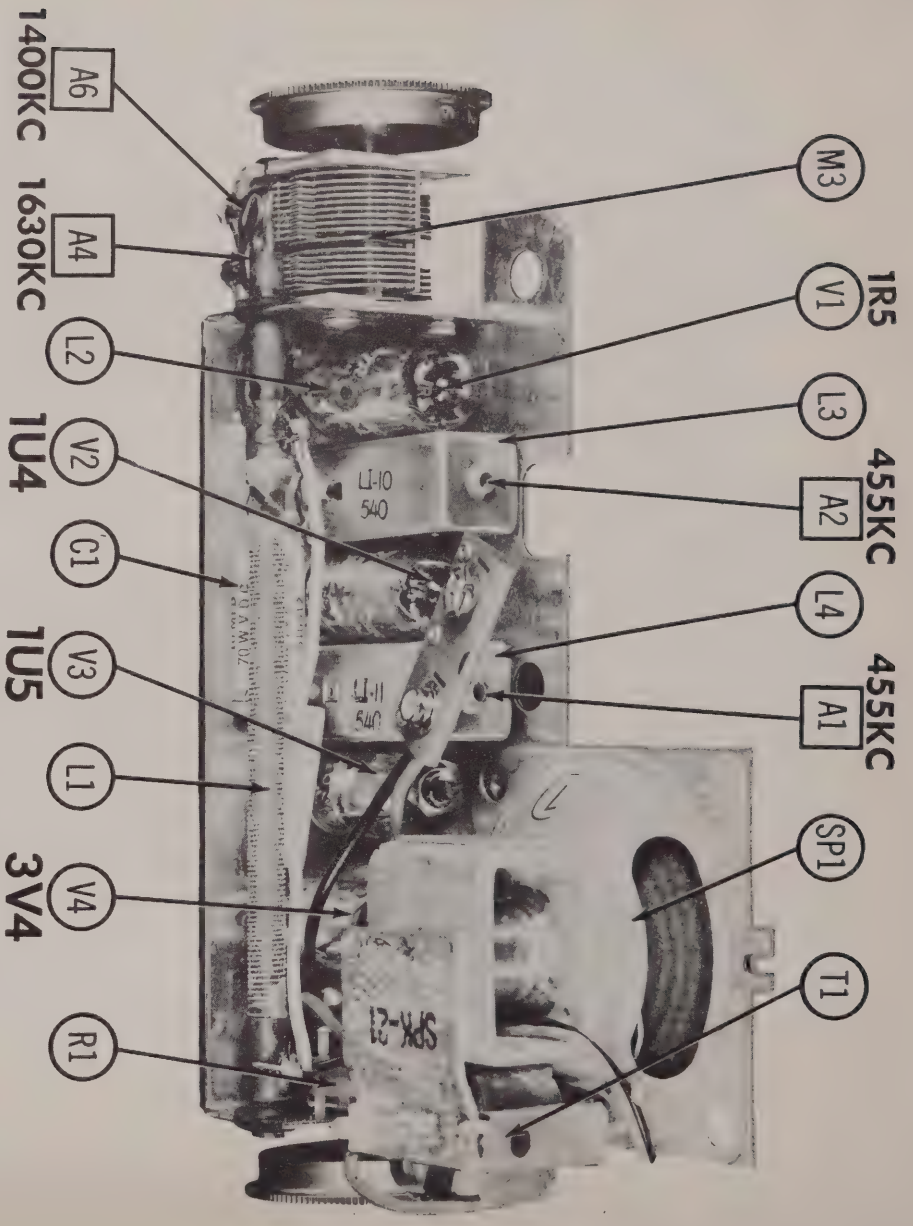
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: TRAVLER PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	220KΩ	½	1R-20	BTS-220K	
R3	3.3Meg	½	1R-23	BTS-3.3Meg	
R4A	10Meg	½	*PC-165	BTS-10Meg	
B	4.7Meg	½		BTS-4.7Meg	
C	1Meg	½		BTS-1Meg	
D	3.3Meg	½		BTS-3.3Meg	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: TRAVLER PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R5	620Ω	½	1R-39		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: TRAVLER PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T1	9.8KΩ	3.1Ω	400Ω	.4Ω	Part of Spkr.	A-3329①			S-11X ①	① Bend mounting tabs down, file out slots, mount on original mounting bracket.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	TRAVLER PART No.	JENSEN PART No.	QUAM PART No.	
SP1	3"	PM	3.1Ω	SPK-21			

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	TRAVLER PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	2.1Ω		LL-30				
L2	Osc. Coil	1.3Ω	9Ω	LO-18			71-Osc.	
L3	Input IF	35Ω	35Ω	LI-10	16-6758	BC-352	12-C1	
L4	Output IF	43Ω	43Ω	LI-11	16-6758	BC-353	12-C2	

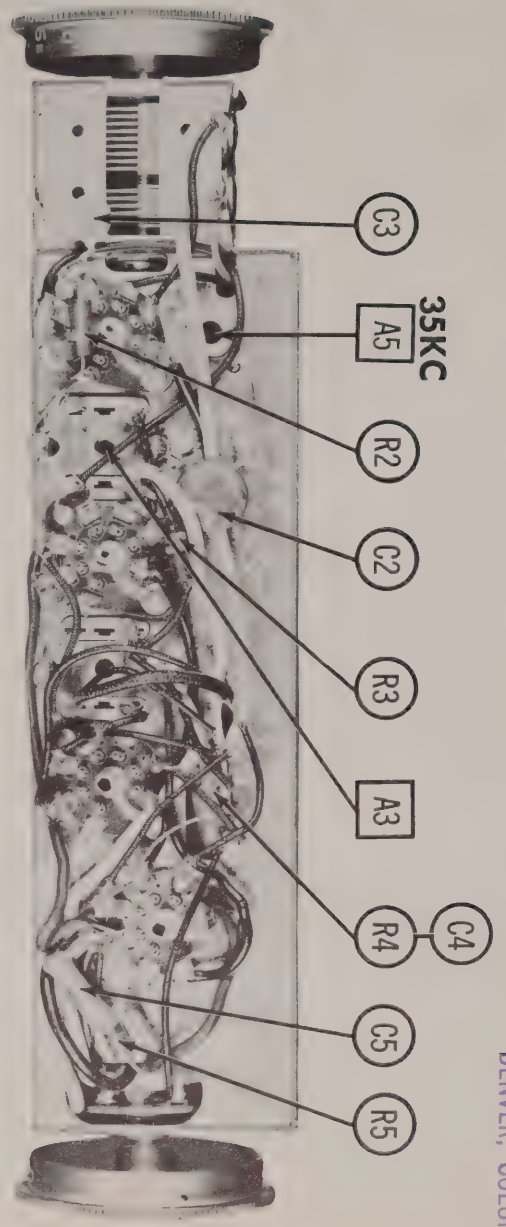
BATTERIES

ITEM No.	VOLTAGE	TRAVLER PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M1 M2	1½ V. 67½ V.		964	477		2IR	P45		2 used in parallel

MISCELLANEOUS

ITEM No.	PART NAME	TRAVLER PART No.	NOTES
M3	Tuning Cap.	GC-12	(13-240MMF, 13-110MMF)

CHASSIS—BOTTOM VIEW



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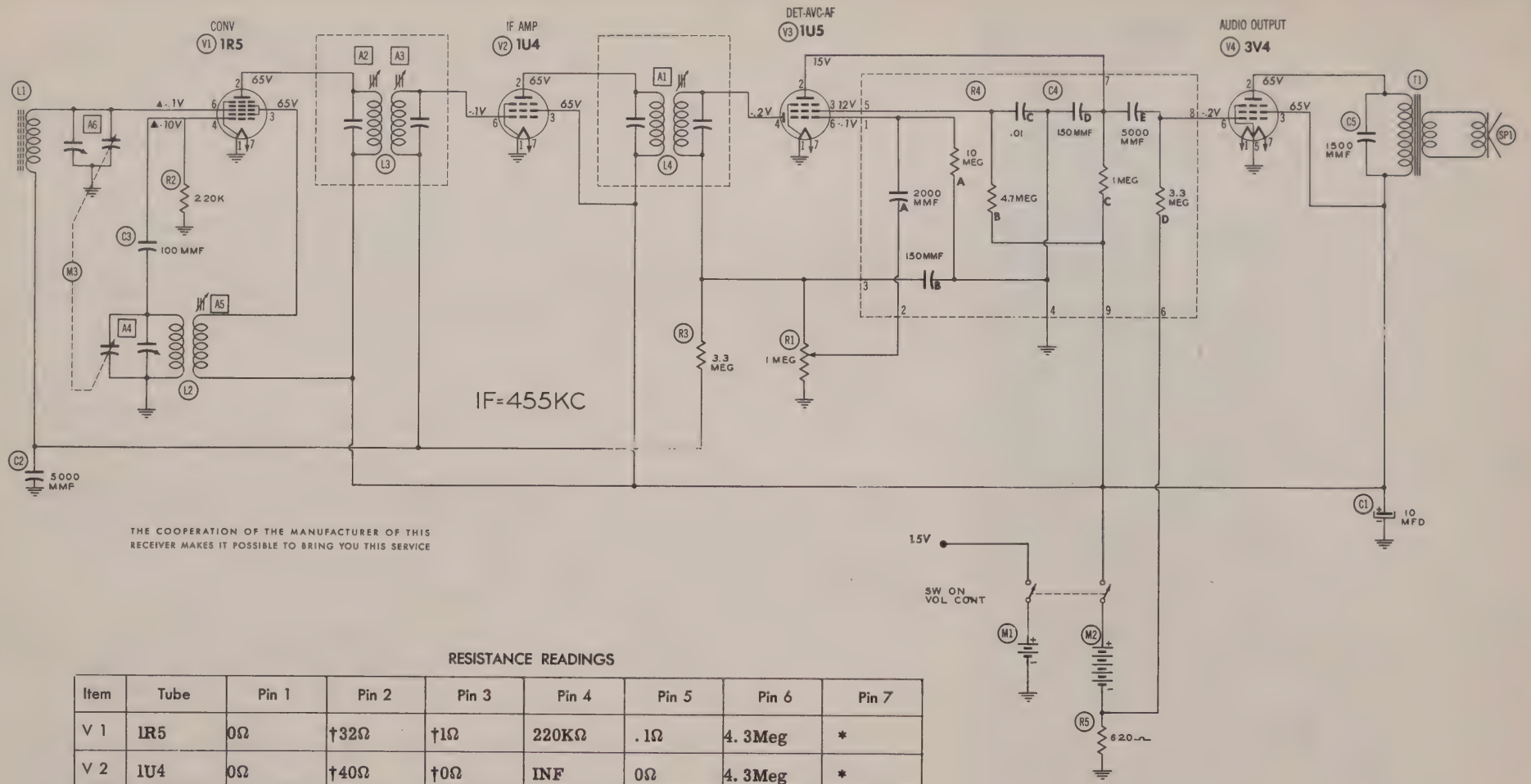
TRAVLER MODEL 5300



THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1R5	0Ω	†32Ω	†1Ω	220KΩ	.1Ω	4. 3Meg	*
V 2	1U4	0Ω	†40Ω	†0Ω	INF	0Ω	4. 3Meg	*
V 3	1U5	0Ω	†1Meg	†4. 7Meg	1Meg	INF	10Meg	*
V 4	3V4	*	†400Ω	†0Ω	500Ω	0Ω	3. 3Meg	*

† MEASURED FROM PIN 3 OF V4.
* DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.
▲ TAKEN WITH VACUUM TUBE VOLTMETER

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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223-13

1 - DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2 - Socket connections are shown as bottom views.
3 - Measured values are from socket pin to common negative.
4 - Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5 - Volume control at maximum, no signal applied for voltage measurements.

PHOTOFACT* Folder

ZENITH MODELS L1812E, R, L1820E, R (Ch. 19L26), L2229E, R, L2235E, R (Ch. 19L28)

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MODEL L1820R

ZENITH MODELS L1812E, R, L1820E, R (Ch. 19L26), L2229E, R, L2235E, R (Ch. 19L28)

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*TRADE MARK

RETMA MEMBER

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L. F. FLANNIGAN
3924 MEADE ST.
DENVER, COLORADO

ZENITH MODEL L1820R

TRADE NAME	Zenith models L1812E, R, L1820E, R (CH. 19L26) L2229E, R, L2235E, R (CH. 19L28)
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Ill.
TYPE SET	Television Receiver
TUBES	Nineteen
POWER SUPPLY	110-12- Volts AC-60 cycle RATING 1.8 Amp. @ 117 Volts AC
TUNING RANGE-	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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ZENITH MODELS
L1812E, R, L1820E, R (Ch. 19L26),
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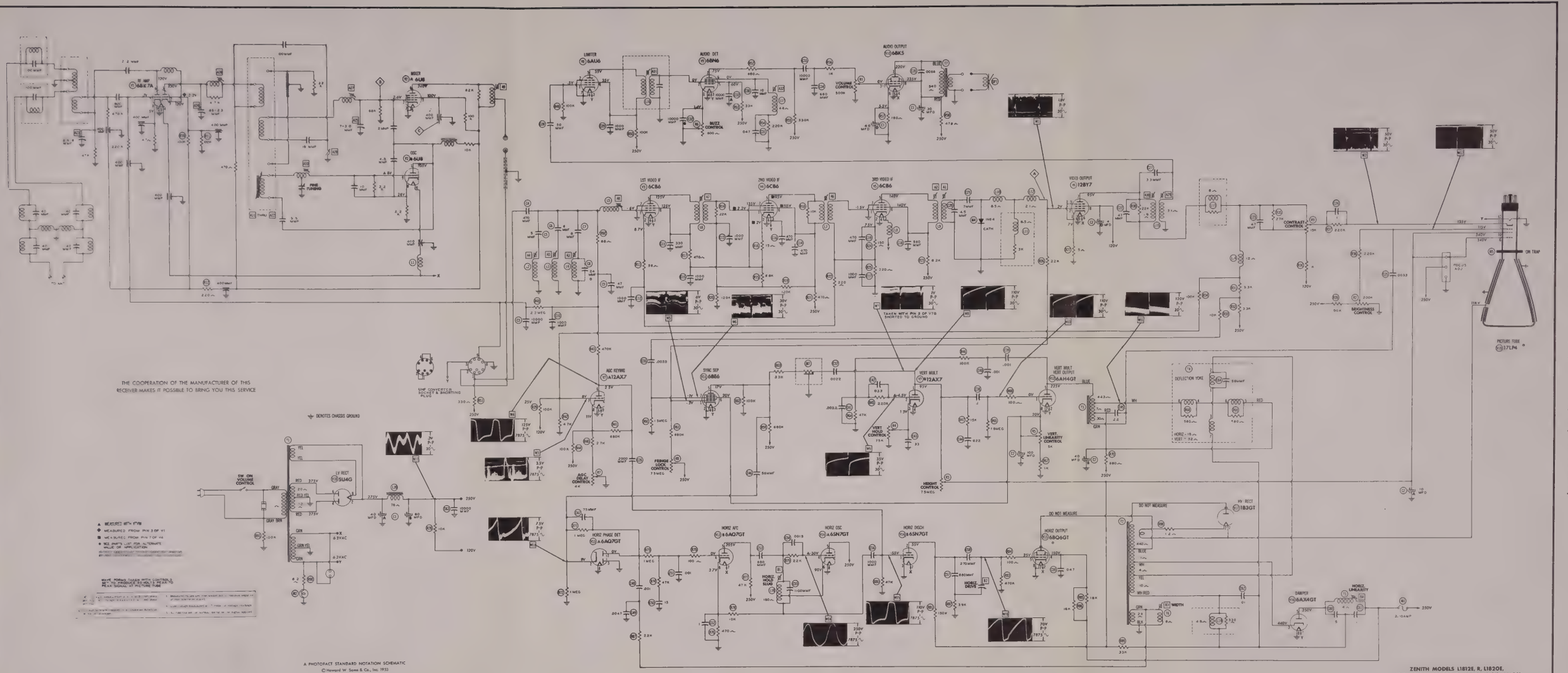
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DENOTES CHASSIS GROUND
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ZENITH MODELS L1812E, R, L1820E, R (Ch. 19L26), L2229E, R, L2235E, R (Ch. 19L28)

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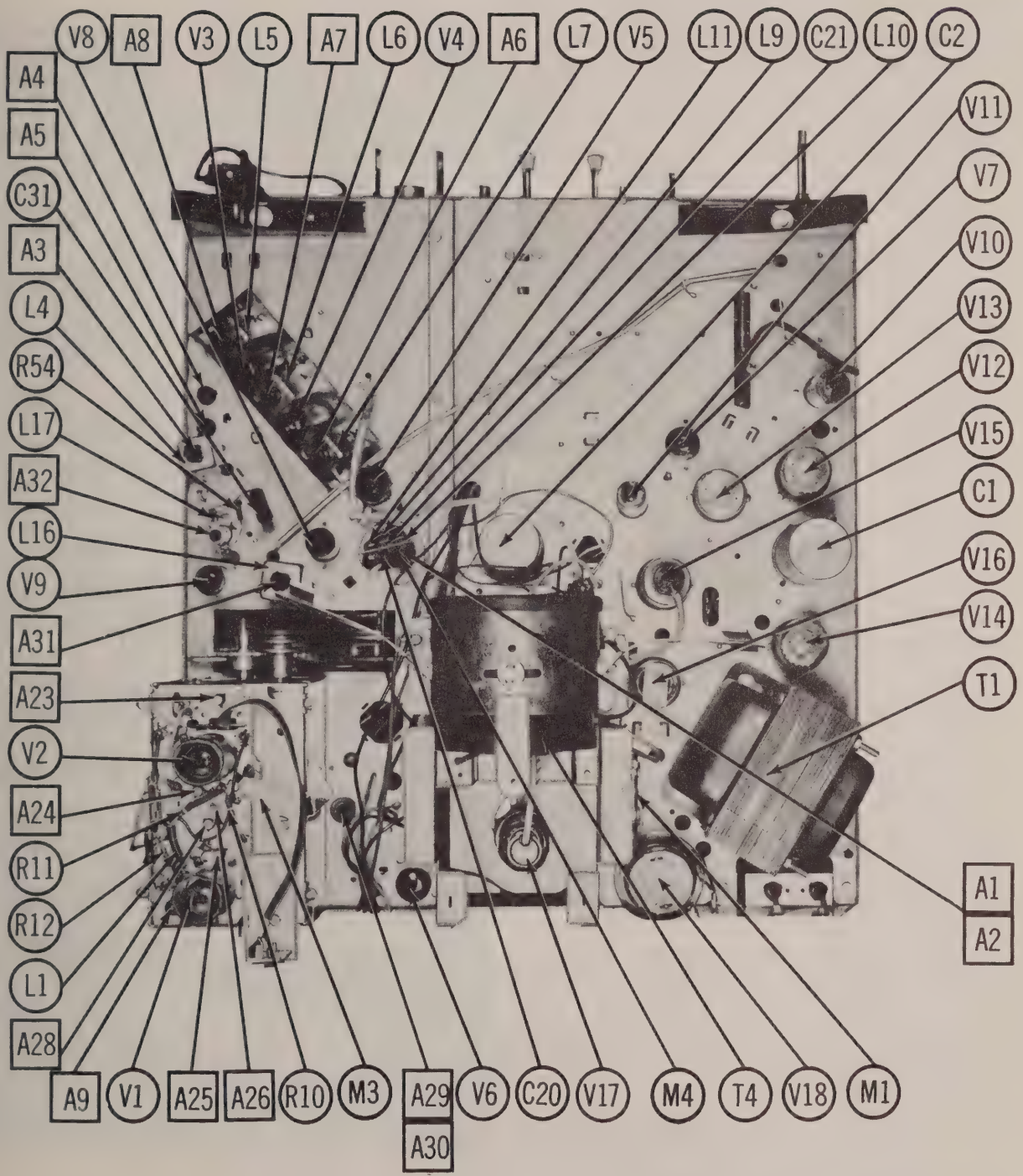
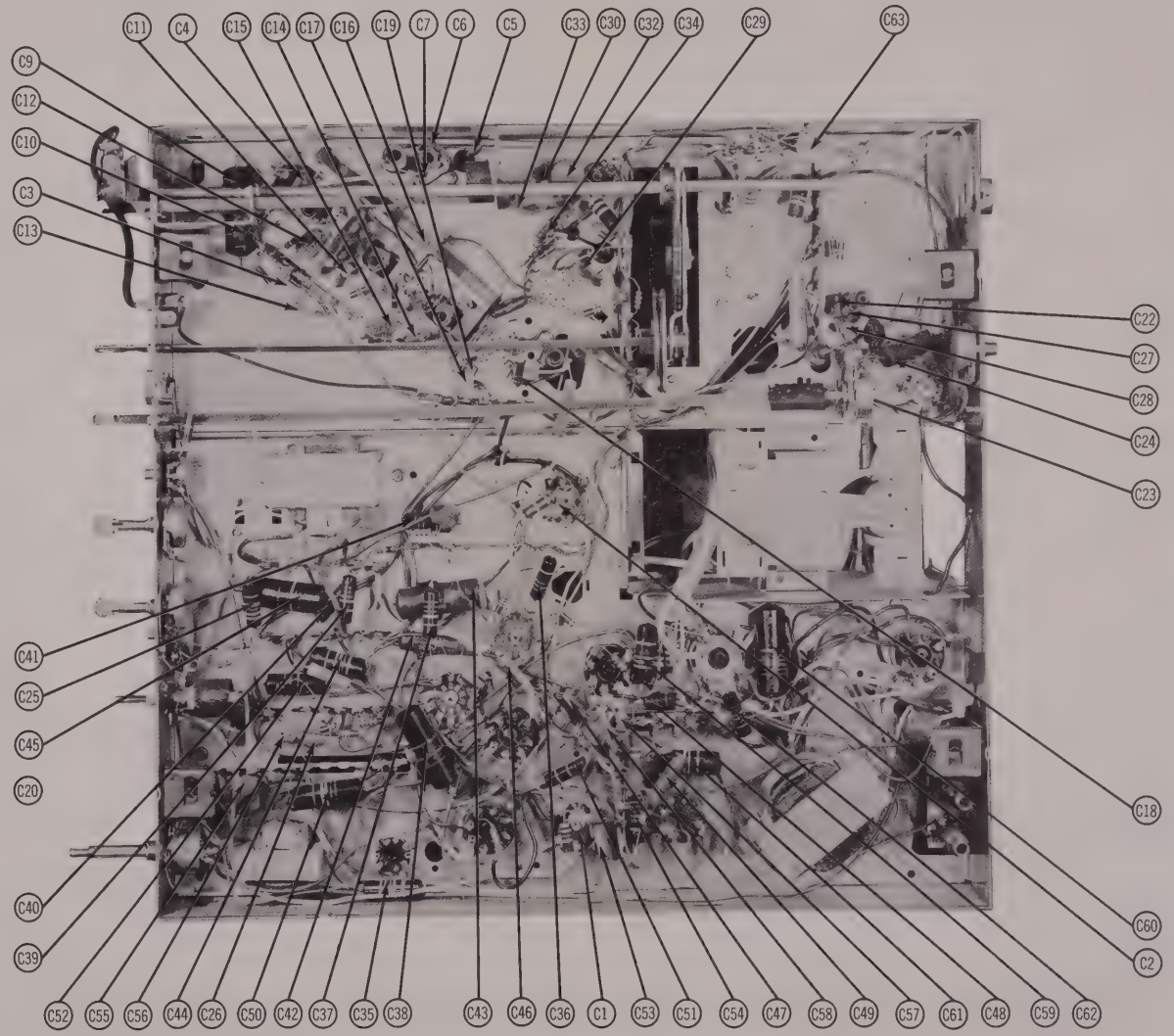


CHASSIS TOP VIEW

SET 223 FOLDER 14



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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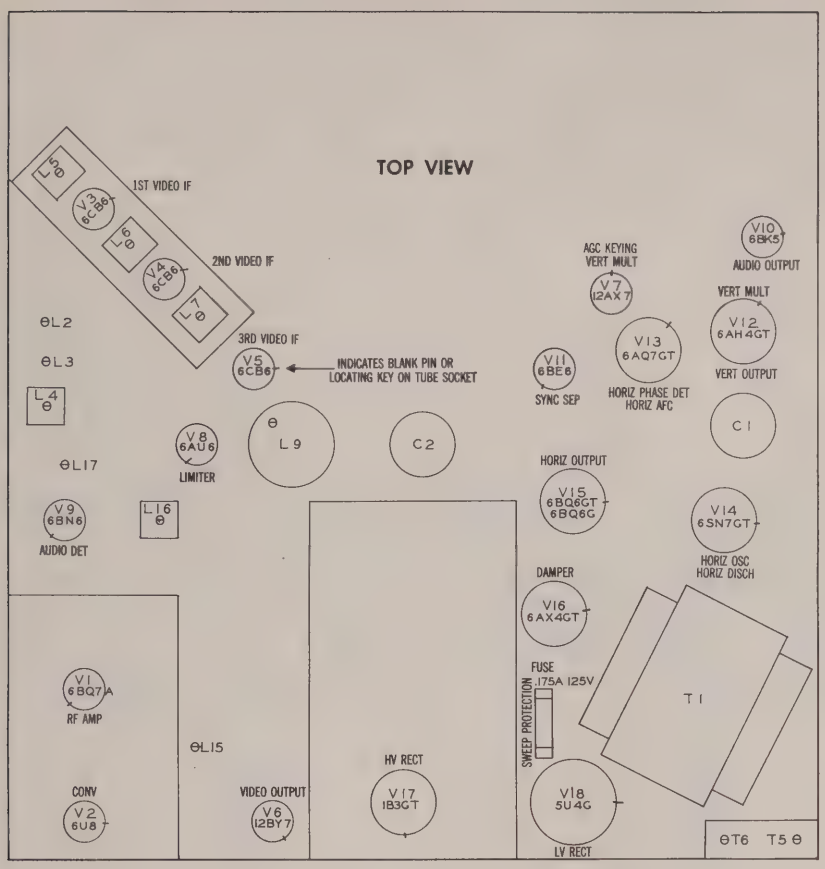
TUBE PLACEMENT CHART



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TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V18

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V19
Has pic, no sound - V8, V9, V10
Overloaded picture - V7

SYNC FAILURE
No vert. sync - V7, V11, V12
No horiz. sync - V11, V13, V14
No vert. or horiz. sync - V11

SWEEP FAILURE
No raster, has sound - V14, V15, V16, V17, V19 Fuse (M1)
No vertical deflection - V7, V12
Poor vert. linearity or foldover -V7, V12
Poor horiz. linearity or foldover - V14, V15, V16
Narrow picture -V14, V15, V16, V17, V18
Vert. off freq. - V7, V11, V12
Horiz. off freq. - V11, V13, V14

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis.

VIDEO IF ALIGNMENT

Connect the negative lead of a 2 volt battery to the ungrounded side of C9. Connect the positive lead to chassis. The bias supply should be such that it can be varied from 3 volts negative to 3 volts positive. Keep bias supply leads short.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Alternate the sweep generator output so as not to exceed 3 volts peak to peak at the detector output.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	470MMF	High side to pin 1 (grid) of 6CB6 (V5). Low side to chassis.	43MC (10MC Swp)	41.25MC 45.75MC	Any non-interfering channel	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A1, A2	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1. If a similar response cannot be obtained, check the position of the two slugs. They must enter their respective coils from opposite ends of the coil form.
2.	"	High side to point (B). Low side to chassis.	"	39.75MC 41.25MC 47.25MC	"	"	A3, A4, A5	Adjust for MINIMUM marker amplitude as in Fig. 2. If necessary reduce bias to zero or go SLIGHTLY positive and set vertical gain of scope near maximum to see trap slots. Return to -2 volts bias.
3.	"	"	"	42.75MC 45.0MC 45.75MC	"	"	A6, A7, A8, A9	ALTERNATELY adjust A6 thru A9 for response similar to Fig. 3. If necessary retouch A1 and A2.

OSCILLATOR ALIGNMENT

The master oscillator adjustment of A10 is to be made only if adjustment of the individual channel oscillator adjustment fail to bring the channels within the range of the fine tuning control. If channels 2 through 6 fall within the range of the fine tuning control but the higher channels do not, slight adjustment of A10 may bring the higher channels in.
Connect the negative negative lead of a 1volt bias supply to the ungrounded side of C9. Connect the positive lead to chassis.
Turn the oscilloscope gain up so that the sound trap notch in the response curve becomes visible.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	57MC (10MC Swp)	59.75MC	2	Vert. Amp. to point (A). Low side to chassis.	A11	Adjust to place sound marker in notch as in Fig. 4.
			63MC (10MC Swp)	65.75MC	3		A12	
			69MC (10MC Swp)	71.75MC	4		A13	
			79MC (10MC Swp)	81.75MC	5		A14	
			85MC (10MC Swp)	87.75MC	6		A15	
			177MC (10MC Swp)	179.75MC	7		A16	
			183MC (10MC Swp)	185.75MC	8		A17	
			189MC (10MC Swp)	191.75MC	9		A18	
			195MC (10MC Swp)	197.75MC	10		A19	
			201MC (10MC Swp)	203.75MC	11		A20	
			207MC (10MC Swp)	209.75MC	12		A21	
			213MC (10MC Swp)	215.75MC	13		A22	

RF AND MIXER ALIGNMENT

Ground the turret AGC bus (yellow lead) to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	69MC (10MC Swp)	67.25MC 71.75MC	4	Vert. Amp. thru 10KΩ to point (C). (On top of tuner) Low side to chassis.	A23, A24 A25	Adjust for response curve similar to Fig. 5.
6.	"	"	201MC (10MC Swp)	199.25MC 203.75MC	11	"	A26, A27	Adjust for response similar to Fig. 6. If band pass is too wide or too narrow adjust A28. Remove the jumper grounding the AGC line.

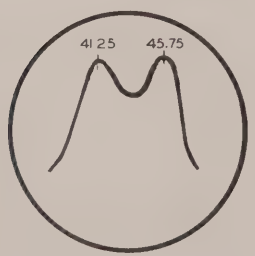

FIG. 1

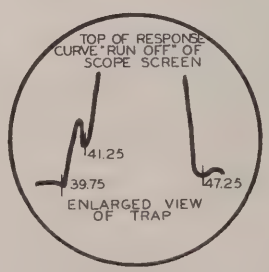

FIG. 2

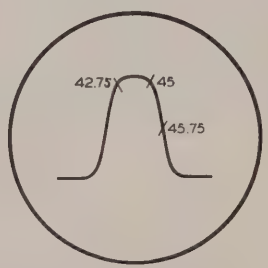

FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

SOUND IF ALIGNMENT

Connect an attenuator (Zenith part #S-17203 or equivalent) in series with the receiver antenna. Tune in a tone modulated TV signal and adjust the attenuator until the signal falls below the limiting level of the 6BN6 limiter-detector, as evidenced by a hiss similar to super-regeneratim.
Adjust the sound take-off coil (A29 and A30), the sound IF coil (A31) and the quadrature coil (A32) for maximum sound and best quality.
Adjust the buzz control R6 for minimum intercarrier buzz.
If the intercarrier buzz cannot be eliminated with the buzz control check the setting of the AGC delay adjustment.
If during the sound IF alignment the signal rises above the limiting level (hiss disappears) increase the attenuation until the hiss returns.

FIG. 4

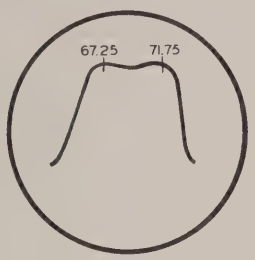

FIG. 5

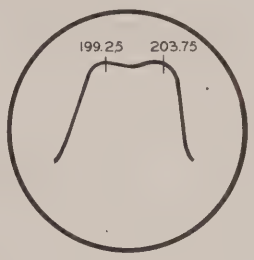

FIG. 6

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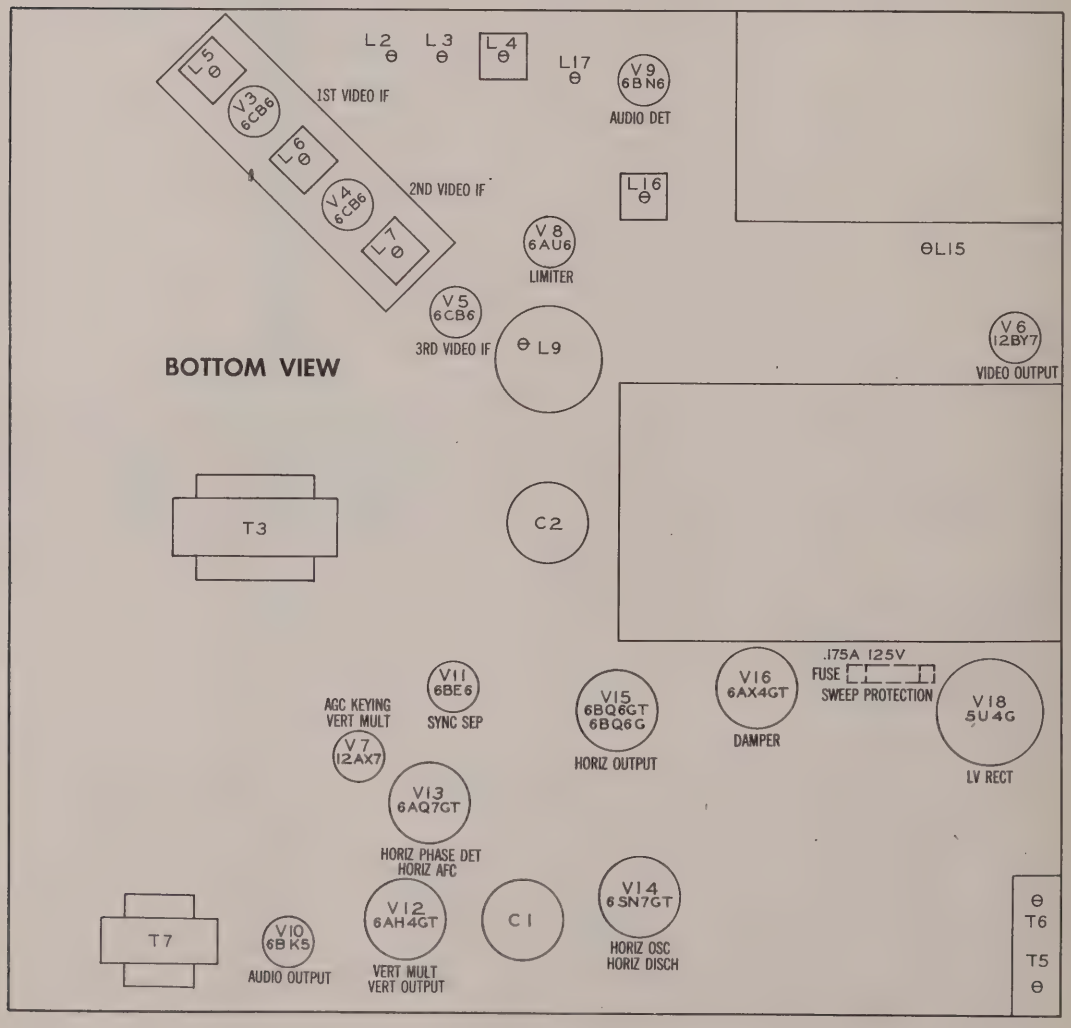
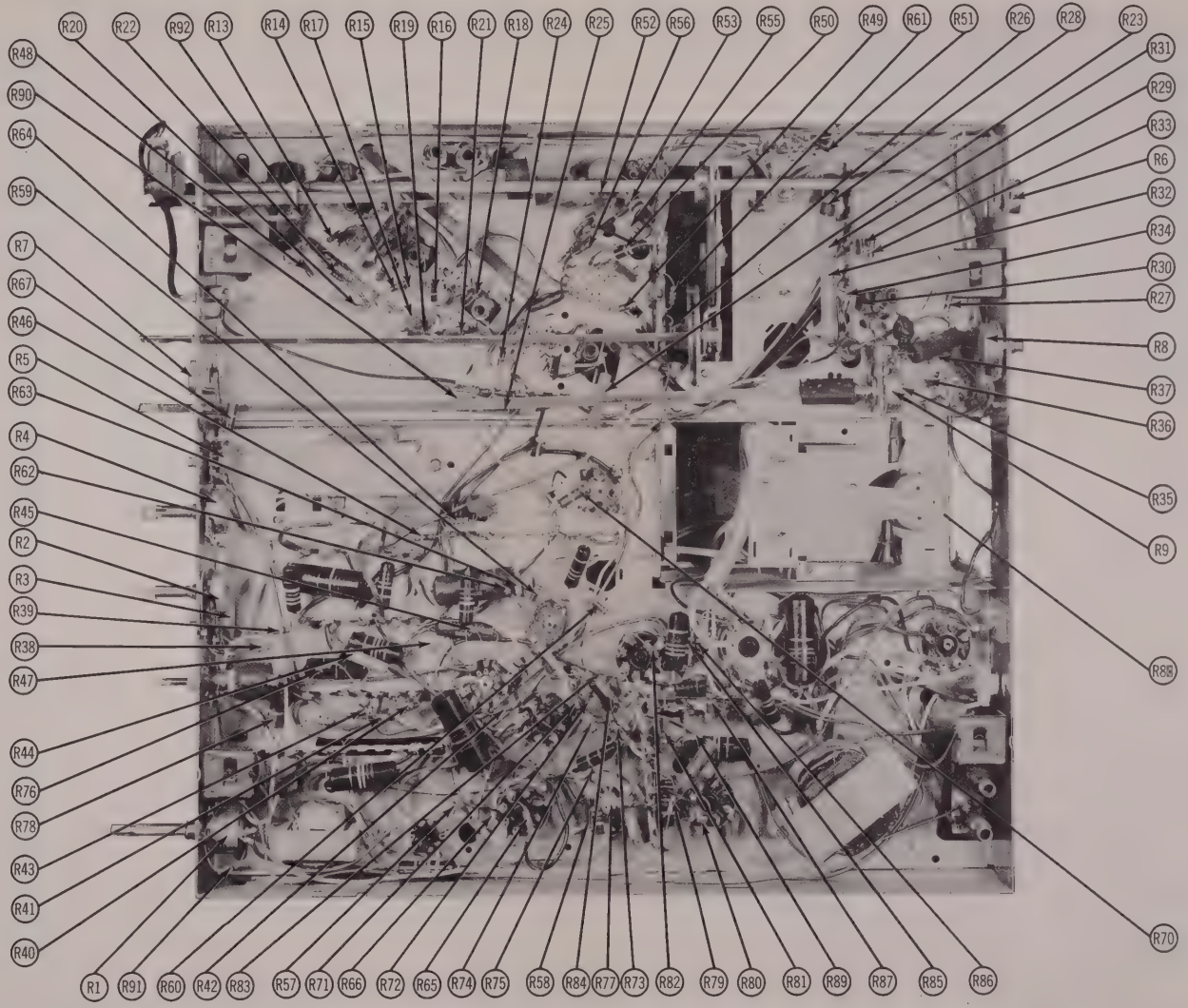
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BK7A	■400N	50KΩ	INF	.1Ω	0Ω	INF	3.5Meg	47Ω	0Ω
V 2	6U8	■10.4K	68KΩ	■100KΩ	.1Ω	0Ω	410Ω	0Ω	2.2KΩ	4.4KΩ
V 3	6CB6	1Meg	500Ω	.1Ω	0Ω	■70KΩ	■70KΩ	0Ω		
V 4	6CB6	*6.8KΩ	*15Ω	.1Ω	0Ω	■550Ω	■550Ω	■70KΩ		
V 5	6CB6	220K	370Ω	.1Ω	0Ω	■8.2KΩ	■8.2KΩ	0Ω		
V 6	12BY7	15Ω	2.9KΩ	15Ω	0Ω	0Ω	.1Ω	■5KΩ	■10KΩ	15Ω
V 7	12AX7	▲4Meg	270KΩ	25KΩ	0Ω	0Ω	■780KΩ	4.7KΩ	4.3KΩ	.1Ω
V 8	6AU6	100KΩ	0Ω	.1Ω	0Ω	■100KΩ	■100KΩ	0Ω		
V 9	6BN6	250Ω	.3Ω	.1Ω	0Ω	■33KΩ	220KΩ	■330KΩ		
V 10	6BK5	■1.1KΩ	INF	50KΩ	.1Ω	0Ω	180Ω	50KΩ	■550Ω	INF
V 11	6BE6	25KΩ	0Ω	.1Ω	0Ω	■100KΩ	1.3Ω	1.5Meg		
V 12	6AH4GT	1.8Meg	.1Ω	1.7Meg	INF	■1KΩ	INF	0Ω	1.3KΩ	
V 13	6AQ7GT	2Meg	1Meg	0Ω	3Meg	■47KΩ	470Ω	.1Ω	0Ω	
V 14	6SN7GT	47KΩ	▲185KΩ	0Ω	32.5KΩ	■85Ω	10.5KΩ	.1Ω	0Ω	
V 15	6BQ6GT	INF	.1Ω	3.9KΩ	■9KΩ	470KΩ	470KΩ	0Ω	0Ω	TOP CAP ▲11Ω
V 16	6AX4GT	95KΩ	1.2Ω	100KΩ	20KΩ	■90Ω	95KΩ	.1Ω	0Ω	
V 17	1B3GT	PINS 1-8 HAVE INF RESISTANCE								TOP CAP ▲450Ω
V 18	5U4G	INF	20KΩ	20KΩ	22Ω	INF	20Ω	INF	20KΩ	
V 19	17LP4	0Ω	■290KΩ	PIN 6 ▲33KΩ	PIN 10 ▲33KΩ	PIN 11 ■220KΩ	PIN 12 .1Ω			

■ MEASURED FROM PIN 2 OF V18.
▲ MEASURED FROM PIN 3 OF V16.
* MEASURED FROM PIN 7 OF V4.



TUBE PLACEMENT CHART



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PROPERTY OF
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3924 MEADE ST.
DENVER, COLORADO

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

See "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V14, V15, V16 and V18. Check adjustments of B2, B3 and B4. Check waveform W16.

If Satisfactory	If Unsatisfactory
Check C59, R85, R86, T2 and T4A.	Check R80, R81, R82, R83, C57, C58, C56, C57 and other associated components.

DRIVE LINES

Check adjustment of B2. Check by substitution V14, V15 and V16. Check T2, T4A,and other associated components.

COMPRESSED LEFT SIDE

Check adjustment of B2, B3 and B4. Check V14, V15 and V16. Check T2, T4A and damper filter components.

FOLDS

Check by substitution V15 and V16. Check T2, T4A and other associated circuit components.

XMAS TREE EFFECT

Substitute V14 and V13. Check C54, C55, C56, L18 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V7 and V12. Check waveform W10.

If Satisfactory	If Unsatisfactory
Check R70, T3, T4B, R67, R5 and other associated components.	Check R3, R4, R64, R45, R65, C38 and other associated components.

INSUFFICIENT SWEEP

Check adjustment of vertical size and vertical linearity controls. Proceed as outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Check by substitution V7 and V12. Check components associated with V7B. Check T3 and T4B.

COMPRESSED AT TOP

Check by substitution V7 and V12. Check C2B, C2C, T3 and T4B. Check other associated circuit components.

FOLDS

Check by substitution V7 and V12. Check components associated with V7B and V12 especially C38, C44, R65 and R47.

SYNC

LOSS OF HORIZONTAL AND VERTICAL SYNC

Check setting of AGC delay control and adjustment of fringe lock control. Check by substitution V7 and V11. Check C36 and other associated circuit components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Check by substitution V7 and V11. Check M7. Check other components associated with V7B.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Check by substitution V13 and V14. Check components associated with these stages.

CRITICAL HORIZONTAL AND VERTICAL SYNC

Check setting of fringe lock and AGC delay controls. Check by substitution V7 and V11. Check components associated with these stages.

HORIZONTAL BENDING OR S-ING

Check by substitution V14 and V15. Check circuit near these stages for filament lead dress. Check AFC filter network for component failure or change of value.

VERTICAL JITTERING OR TRIGGERING

Check by substitution V11 and V7. Check circuit near these stages for filament lead dress. Check video signal for interference pulses.

VIDEO

LOSS OF VIDEO

Check C24, R37, R9, R36, V19 and other associated circuit components.

SOUND BARS (4.5MC Beat)

Check "Bull's Eye" adjustment in tuner. Check adjustments of A29 and A30. Check Video IF Alignment.

NEGATIVE PIX

Check by substitution V6 and V7. Check AGC delay control setting. Check AGC network for component failure or change of value. Check video IF tubes and components.

POOR CONTRAST

Substitute V6. Check video detector crystal and assembly. Check picture tube and other associated circuit components.

SMEAR

Substitute V6. Check video detector crystal and assembly. Check R28, R32, R31, R35, R36, R9 and R37 for change of value. Check L13 and C24. Check picture tube and other associated components.

WIDE BLACK BAR ACROSS PIX

Check V1, V2, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9 and V10. Check R58, R57, R56, R55, R1, R53, R54, R50 and R49. Check C33, and C34. Check other associated components. Check audio IF and audio detector alignment. Follow procedure outlined in the alignment section.

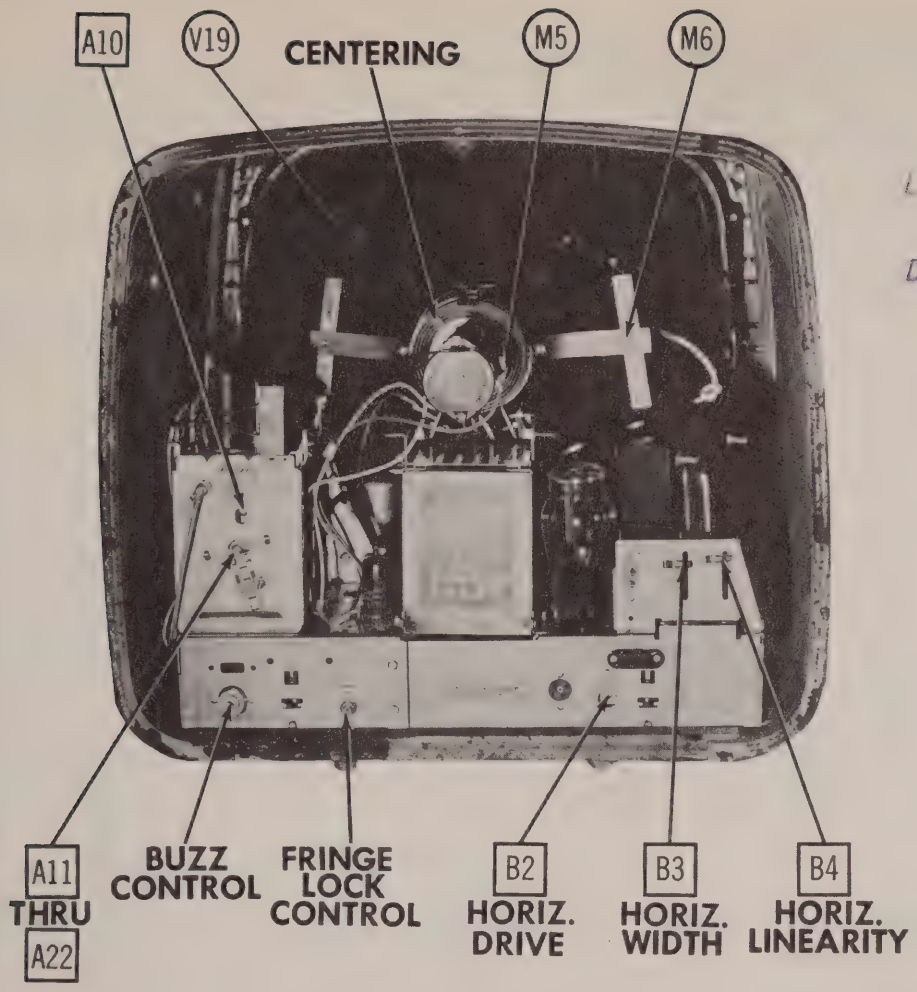
BUZZ

Adjust buzz control for minimum buzz. If buzz is still objectionable substitute V9 and realign audio detector as outlined in the alignment section. Check components associated with V9.

DISTORTED

Check by substitution V8, V9 and V10. Check stage of V10 using audio signal generator and scope. Apply audio signal across R1. Connect scope across primary of T7.

If Satisfactory	If Unsatisfactory
Check audio IF and audio detector alignment and components.	Check components associated with V10.



PROPERTY OF
L. F. BLANKENSHIP
3984 MEADE ST.
DENVER, COLORADO

CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Adjust the horizontal hold (B1) until the picture synchronizes horizontally.

Adjust the horizontal drive trimmer (B2) for greatest picture width.

Adjust the width slug (B3) for a picture slightly wider than necessary to fill the picture mask horizontally.

Adjust the horizontal linearity slug (B4) for a picture that is symmetrical from left to right.

AGC DELAY CONTROL ADJUSTMENT

Connect the vertical amplifier of an oscilloscope through 10KΩ to point ◇A◇. Select the strongest TV signal available and adjust the delay control for 2.5 Volts (2.75V on 19L26 and 28 models) peak output.

DISASSEMBLY INSTRUCTIONS

1. Remove 5 push on type control knobs from front panel.
2. Remove 7 wood screws. Remove rear cover.
3. Disconnect built-in antenna and speaker.
4. Remove 4 chassis bolts. Remove chassis.
5. Remove 2 wood screws from bottom of speaker bracket, remove 1 screw at top of speaker housing. Speaker will then swing down. Remove 4 metal screws. Remove speaker.

NOTE: Speaker must be in raised position for removal.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC or Equivalent)

ITEM No	USE	REPLACEMENT DATA: ZENITH PART No	STANDARD REPLACEMENT	RTMA BASE TYPE	NOTES
V1	RF Amplifier	6BK7A	6BK7A	9AJ	
V2	Converter	6U8	6U8	9AE	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output	12BY7	12BY7	9BF	
V7	AGC Keying-Vert. Mult.	12AX7	12AX7	9A	
V8	Limiter	6AU6	6AU6	7BK	
V9	Audio Detector	6BN6	6BN6	7DF	
V10	Audio Output	6BK5	6BK5	9BQ	
V11	Sync Separator	6BE6	6BE6	7CH	
V12	Vert. Mult.-Vert. Output	6AH6GT	6AH6GT	8EL	
V13	Horiz. Phase Det.-Horiz. AFC	6AQ7GT	6AQ7GT	8CK	
V14	Horiz. Oscillator-Horiz. Discharge	6SN7GT	6SN7GT	8BD	
V15A	Horiz. Output	6BQ6GT	6BQ6GT	6AM	
B	Horiz. Output Damper	6BQ6G	6BK5	9BQ	
V16		6AX4GT	6AX4GT	4CG	
V17	HV Rectifier	1B3GT	1B3GT	9C	
V18	LV Rectifier	5U4G	5U4G	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: ZENITH PART No.	SYLVANIA PART No.	GENERAL ELECTRIC PART No.	RTMA BASE TYPE	NOTES
19A	17LP4	17LP4		12C	
		17VP4		12C	
B	21YP4	21YP4		12C	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C1A	≋40	400	22-2358	AFH3-135		CO37		FP430.6	TVL-4670	
B	≋80	400		PR8450/3D		BR502A		TC77		
C	≋30	400								
D	40	25								
C2A	≋10	475	22-2479	E4D641			FP386		TVL-4817	
B	≋40	400					TC80		TVA-1310	
C	100	50								
D	≋4	350								
C3	10000		22-3	BPD-01	DD-1032	TM5S1	81-01	DC-511	5HK-S1	
C4	470		22-2217	B1470	D6-471		GP2K-471	UC-5347	5GA-T47	
C5	5		22-2380	S15NP0	TCZ-4.7		NP0K-050	ZT-555	5TCCB-V47	
C6	6		22-2381							
C7	8		22-2481							
C8	24									Note 1
C9	.47	200	22-2145	P288-47		PJ2P5		PT405	2TM-P47	
C10	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C11	330		22-2309	S1330	D6-331		GP2K-331	UC-5333	5GA-T33	
C12	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C13	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C14	470		22-2302	S1470	D6-471		GP2K-471	UC-5347	5GA-T47	
C15	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C16	470		22-6	BPD-00047	D6-471		GP2K-471	UC-5347	5GA-T47	
C17	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C18	560		22-2310	S1560	D6-561		GP2K-561		5GA-T56	
C19	470		22-2217	B1470	D6-471		GP2K-471	UC-5347	5GA-T47	
C20	4.5		22-2383							
C21	7		22-2375							
C22	47		22-2467	S147N080			N080-338-470			
C23	47		22-2325	S147	D6-470		GP1K-470	UC-5447	5GA-Q47	
C24	.1	200	22-1777	P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C25	.0033	600	22-2240	P688-0033	D6-332	PTE6D33	GP2-333-332	PT6233	6TM-D33	
C26	2000		22-8	BPD-002	DD-202	TM5D2	801-002	DC-522	5HK-D2	
C27	3.3		22-2243	S13.3NP0	TCZ-3.3		NP0K-3R3	ZT-5533	5TCCB-V33	
C28	50		22-2460	S150	D6-500	TM5Q5	GP1K-500	UC-545	5GA-Q5	
C29	1000		22-7	BPD-001	DD-102	TM5D1	801-001	DC-521	5HK-D1	
C30	10		22-2378							
C31	.047	200	22-1778	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C32A	10000		22-2276	BPD-2X01	DD3-103	TM5D51	81-01	DCD-511	5HK-231	
B	10000						81-01			
C33	10000		22-3	BPD-01	DD-1032	TM581	611-01	DC-511	5HK-S1	
C34	680		22-2320	S1680	D6-681		GP2K-681	UC-5368	5GA-T68	
C35	.0068	600	22-2228	P688-0068	D6-682	PTE6D68	GP2-333-682		6TM-D68	
C36	.0033	600	22-1776	P688-0033	D6-332	PTE6D33	GP2-333-332	PT6233	6TM-D33	
C37	.0022	600	22-1845	P688-0022	D6-222	PTE6D22	GP2-333-223	PT6222	6TM-D22	
C38	.1	600	22-1841	P688-1	DF-104	PTE6P1		PT601	6TM-P1	
C39	.001	600	22-2126	P688-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C40	.001	600	22-2126	P688-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C41	.0022	600	22-1814	P688-0022	D6-222	PTE6D22	GP2-333-223	PT623	6TM-D22	
C42	.033	200		P488-033				PT4153		
C43	.33	200	22-2150	P288-33						
C44	.022	600	22-2129	P686-022		PTE6S22		PT6122	6TM-S22	
C45	.22	200	22-2167	P488-22		PTE4P22		PT4022	2TM-P22	
C46	56	500	22-1831							
C47	75	500	22-2256	1469-000075				MCB330		
C48	.001	600	22-2127	P686-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C49	.0047	200	22-1842	P688-0047	D6-472	PTE6D47	GP2-333-472	PT6247	6TM-D47	
C50	.15	200	22-2168	P288-15		PTE4P15		PT4015	2TM-P15	
C51	.001	600	22-2127	P686-001	D6-102	PTE6D1	GP2L-102	PT621	6TM-D1	
C52	.1	200	22-1777	P288-1	DF-104	PJ2P1		PT401	2TM-P1	
C53	680	500	22-2325							
C54	.0015	400	22-1785	P688-0015	D6-152	PTE6D15	GP2L-152		6TM-D15	
C55	1100	500	22-2416							
C56	1000		22-2123	S11000	D6-102	TM5D1	GP2L-102	UC-521	5HK-D1	
C57	680		22-2387	S1680	D6-681		GP2K-681	UC-5368	5GA-T68	
C58	270		22-2498	S1270	D6-271		GP2K-271	UC-5327	5GA-T27	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C59	.047	400	22-1775	P488-047	DF-503	PTE4S47		PT4147	4TM-S47	
C60	.15	400	22-2341	P488-15		PTE4P15		PT401	4TM-P15	
C61	.1	400	22-2340	P488-1		PTE4P1		PT411	4TM-S1	
C62	.01	400	22-1784	P488-01	D6-103	PTE4S1	GP2-333-103	PT4151	4TM-S1	
C63	10000		22-3	BPD-01	DD-1032	TM5S1	811-01	DC-511	5HK-S1	
C64	56	2000							20GA-Q56	

Note 1. Not used in all Models.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	63-2777	Q13-133	AG-60-Z	B8K-80-S	U-48	Volume
B	Shaft		Not Req.	Not Req.	KS8-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWB	Not Req.	Us-26	Attach to R1A
R2A	200KΩ	½	63-2937	Q11-129	AG-52-S	AB-46	U-43	Brightness
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R2A
R3A	7.5Meg	½	63-2394	Q11-142		AB-89		Height-Note
	With 1Meg atop							
B	Shaft		Not Req.	R Q		AK-1		Attach to R3A
R4A	75KΩ	½	63-2896	Q11-125	AG-47-S	AB-35	U-41	Vertical Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R4A
R5A	150ΩΩ	½	63-2815	Q11-110	AG-11-S	AB-6	SU-6	Vertical Linearity
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R5A
R6	600Ω	1	63-3187					Buzz-Wire Wound
R7	4000Ω	1	63-2159					AGC Delay
R8A	7.5Meg	½	63-2805	Q11-142		AB-89	U-82	Fringe Lock
B	Shaft		Not Req.	RQ		AK-1	Not Req.	Attach to R8A
R9A	15KΩ	½	63-2854	Q17-118X				Contrast tapped at 10K
B	Shaft		Not Req.	WQ				Attach to R9A

Note: Connect a 1Meg resistor between the right hand terminal of the control and the lead connecting to the same terminal of the original control (Control viewed from shaft end, terminals down.)

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R10	100KΩ	½	63-1869	BTS-100K	
R11	100KΩ	½	63-1869	BTS-100K	
R12	220Ω	½	63-1758	BTS-220	
R13	56Ω	½	63-1733	BTS-56	
R14	22KΩ	½	63-1841	BTS-22K	
R15	6800Ω	½	63-1821	BTS-6800	
R16	15Ω	½	63-1708	BTS-15	
R17	470Ω	½	63-1772	BTS-470	
R18	10KΩ	½	63-1827	BTS-10K	
R19	120KΩ	½	63-1873	BTS-120K	
R20	120KΩ	½	63-1873	BTS-120K	
R21	470Ω	½	63-1772	BTS-470	
R22	220Ω	½	63-1757	BTS-220	
R23	8.2KΩ	1		BTS-8200	
R24	150Ω	½		BTS-150	
R25	220Ω	½	63-1757	BTS-220	
R26	22KΩ	½	63-1841	BTS-22K	
R27	15Ω	½	63-1708	BTS-15	
R28	10KΩ	2	63-3178	BTB-10K	
R29	100KΩ	½	63-1869	BTS-100K	
R30	22KΩ	½	63-1841	BTS-22K	
R31	3.3KΩ	4	63-2899		
R32	10KΩ	4	63-2899		
R33	10KΩ	½	63-1827	BTS-10K	
R34	100KΩ	½	63-1869	BTS-100K	
R35	2.7KΩ	½	63-1803	BTS-2700	
R36	1000Ω	½	63-1785		
R37	220KΩ	½	63-1883	BTS-220K	
R38	220KΩ	½	63-1883	BTS-220K	
R39	100KΩ	½	63-1870	BTS-100K	
R40	2.7KΩ	½	63-1803	BTS-2700	
R41	680KΩ	½	63-1904	BTS-680K	
R42	4.7KΩ	½	63-1813	BTS-4700	
R43	470KΩ	½	63-1898	BTS-470K	
R44	100KΩ	½	63-1962	BTA-100K	
R45	220KΩ	½	63-1883	BTS-220K	
R46	100KΩ	½	63-1869	BTS-100K	
R47	15KΩ	½	63-1834	BTS-15K	
R48	2.2Meg	½	63-1926	BTS-2.2Meg	
R49	100KΩ	½	63-1869	BTS-100K	
R50	100KΩ	1	63-2781	BTA-100K	
R51	330Ω	1	63-2162	BTA-330K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R52	680Ω	½	63-1779	BTS-680	
R53	33KΩ	2	63-3180	BTB-33K	
R54	220KΩ	½	63-1883	BTS-220K	
R55	330KΩ	½		BTS-330K	
R56	1000Ω	½	63-1786	BTS-1000	
R57	180Ω	½	63-1754	BTS-180	
R58	470Ω	1	63-2398	BTA-470	
R59	680KΩ	½	63-1904	BTS-680K	
R60	1.5Meg	½	63-1915	BTS-1.5Meg	
R61	680KΩ	½	63-1904	BTS-680K	
R62	100KΩ	½	63-1869	BTS-100K	
R63	33KΩ	½	63-1849	BTS-33K	
R64	47KΩ	½	63-1855	BTS-47K	
R65	1.8Meg	½	63-1922	BTS-1.8Meg	
R66	100Ω	½	63-1744	BTS-100	
R67	10000Ω 6%	1	63-3188		
R68	560Ω	½	63-1775	BTS-560	
R69	560Ω	½	63-1775	BTS-560	
R70	680Ω	1	63-2290	BTA-680	
R71	1 Meg	½	63-1911	BTS-1Meg	
R72	1Meg	½	63-1911	BTS-1Meg	
R73	1Meg	½	63-1911	BTS-1Meg	
R74	47KΩ	½	63-1855	BTS-47K	
R75	100Ω	½	63-1744	BTS-100	
R76	470Ω	½	63-1771	BTS-470	
R77	47KΩ	1	63-2194	BTA-47K	
R78	10KΩ	2	63-2145	BTB-10K	
R79	22KΩ	½	63-1842	BTS-22K	
R80	47KΩ	½	63-1856	BTS-47K	
R81	150KΩ	1	63-2130	BTA-150K	
R82	3900Ω	½	63-1810	BTS-3900	
R83	470KΩ	½		BTS-470K	
R84	100Ω	½	63-1744	BTS-100	
R85	18KΩ	2	63-2364	BTB-18K	
R86	18KΩ	2	63-2364	BTB-18K	
R87	22KΩ	1	63-956	BTA-22K	
R88	1.2Ω	1	63-2129		
R89	33KΩ	½	63-1849	BTS-33K	
R90	8.2Ω	2	63-2898	BTB-8.2	
R91	100KΩ	½	63-1870	BTS-100K	
R92	68Ω	½	63-1737	BTS-68	

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: ZENITH PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.
T1	117VAC	560VCT	5VAC	12.6VCT	95-1298			TP-173		
	④ 1.8A	.270ADC	④ 3A	④ 4.8A						

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI	RATING: DC RESISTANCE SEC	REPLACEMENT DATA: ZENITH PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T2	465Ωtap ③ 10, 140, 25Ω	2.5Ω SEC. 3 0Ω	S-19728						Horiz. Output Trans.
T3	680Ωtap ③ 30Ω, 37Ω		95-1361	A-8113 ①		TSO-13			Vert. Output Trans.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI	RATING: DC RESISTANCE SEC	REPLACEMENT DATA: ZENITH PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	RCA TYPE No.	NOTES
T4A	18Ω		95-1357	DY-9A ③, ④	MDP-72 ③	TY-3 ③, ⑤	Y-17 ④		Horiz. Deflection Coils
B	52Ω		S-19898 ②						Vert. Deflection Coils
T5	14Ω		S-18570	WC-2 ①, ②	MWC-2	TL-3 ⑥, ⑦	WC-11 ⑤		Horiz. Linearity Coil
T6	82Ω		S-19486	WC-5 ④	MWC-8	TW-7 ⑦	WC-12 ⑦, ⑧		Width Coil

① Connect blue lead to plate and red lead to point of original B+. The green lead of transformer to white lead of yoke and connect to chassis ground. The white lead of transformer to red lead of yoke and connect to vertical blanking circuit.
② Positioning device and yoke cover (Part of 95-1357).
③ Use original yoke cover and positioning device.
④ Use original horizontal deflection coil network, if necessary.
⑤ Use original deflection coil network.
⑥ Do not use tap.
⑦ Drill new mounting hole.
⑧ Connect to coded orange and green terminals.
⑨ Connect to coded red and blue terminals.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: ZENITH PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	TRIAD PART No.	NOTES
T7	5.7KΩ	3.3Ω	540Ω	.71Ω	95-1340	A-3877	A-2930	RO-9 ①	S-3X	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: ZENITH PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	5 1/4"	PM	3.3Ω	49-744 49-741 ① 49-719 ②	ST-803 Mod. P525-V ST-13 Mod. P4-X	52A21 4A1	① Alternate 5 1/4" PM speaker ② 4" PM speaker used in Models 1812E & 1812R

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: ZENITH PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Fil. Choke	0Ω		20-391				
L2	41.25MC Trap	0Ω		S-19958				Less core, core part #149-111
L3	47.25MC Trap	0Ω		S-18210				Less core, core part #149-111
L4	39.75MC Trap	0Ω		S-20290				Less core, core part #149-111
L5	1st. Video IF	.1Ω		S-19736			6334	Less core, core part #149-111
L6	2nd. Video IF	.1	.1Ω	S-17907			6233 *	Less core, core part #149-110
L7	3rd. Video IF	.1Ω	.1Ω	S-19952			6233 *	Less core, core part #149-110
L8	Fil. Choke	.1Ω		S-18984			4612	9.6 Microhenries, includes core, core part #149-71
L9	4th. Video IF	.3Ω	.3Ω					Video Det. Assy (part #65-18958) Includes 1N64 Crystal detector C20, C21, L9, L10, L11
L10	Series Peaking Coil	8.5Ω		S-19954	19-3160		4644	144 Microhenries
L11	Shunt Peaking Coil	8.5Ω		S-19953	19-3180 †	TV-184 †	4644 †	160 Microhenries, wound on 3KΩ resistor in series
L12	Series Peaking Coil	2.1Ω		S-15128			4612	12 Microhenries
L13	Series Peaking Coil	8Ω		S-20021				Wound on resistor
L14	Shunt Peaking Coil	12Ω		S-17958	19-3500	TV-188	6174	481 Microhenries
L15	1st. Sound IF	1.9Ω	3.1Ω	S-19959				Less core, core part #149-85
L16	2nd. Sound IF	.3Ω	.3Ω	S-20219	19-3445			Less core, core part #149-96
L17	Quadrature Coil	4.6Ω		S-19001	20-1005			Less core, core part #149-110
L18	Horiz. Osc.	160Ω	Tap ⑨ 80Ω	S-19743	19-1577			
L19	Anti-Ringing Coil	4.8Ω		S-20367	19-3189 ▲	TV-184 ▲	6189 ▲	176 Microhenries, wound on 330Ω resistor

* Detune trap
† Add resistor in series
▲ Parallel with 330Ω resistor

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D.C. RESISTANCE	RATINGS: INDUCTANCE @ CURRENT 1000 ~/~	REPLACEMENT DATA: ZENITH PART No.	STANCOR PART No	MERIT PART No	CHICAGO PART No	TRIAD PART No
L20	.270ADC	78Ω	2.85 Hy.	95-1310			TR-3300 ①	

① Drill one new mounting hole.

L. F. CLARKENS
3924 MEADE ST.
DENVER, COLORADO

ZENITH MODELS L1812E, R, L1820E, R (Ch. 19L26), L2229E, R, L2235E, R (Ch. 19L28)

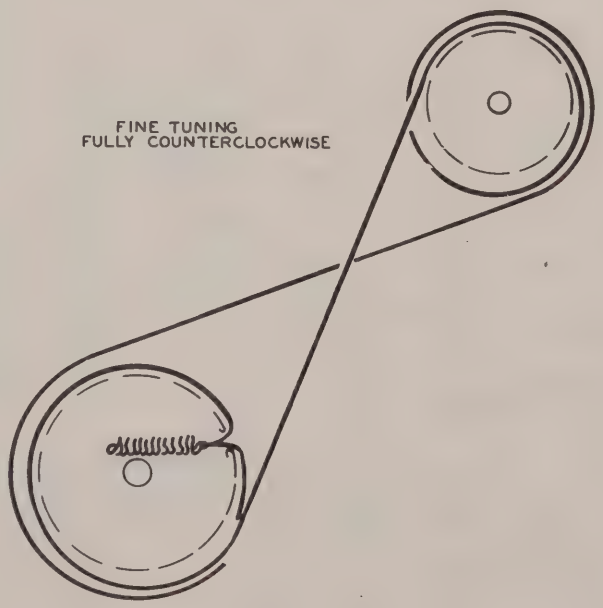
PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ZENITH PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2/10A 250V	136-27	83-1883	312.200 (2/10A-3AG)	357001	AGC 2/10	4405

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M2	Dial Light	100-166	
M3	RF Tuner	S19970	Turret Type
M4	Crystal		1N64
M5	Ion Trap	S17164	
M6	Correction Magnet	S18763	2 required
M7	Integrator	87-1	
B2	Trimmer Cap.	22-2398	Horiz. Drive
	Cabinet	14-1586E	Table Model L1812E (Blond)
	Cabinet	14-1431R	Table Model L1812R (Mahogany)
	Cabinet	14-1588E	Table Model L1820E (Blond)
	Cabinet	14-1588R	Table Model L1820R (Mahogany)
	Cabinet	14-1587E	Tab le Model L2229E (Blond)
	Cabinet	14-1552R	Table Model L2229R (Mahogany)
	Cabinet	14-1589E	Table Model L2235E (Blond)
	Cabinet	14-1589R	Table Model L2235R (Mahogany)
	Knob	46-1051	Fine Tuning (Models L1812E & R, L1820E & R)
	Knob	46-1117	Horiz. Hold (Models L1812E & R, L1820E & R)
	Knob	46-1181	Vert. Hold & Brightness (2 used) Models L1812E & R, L1820E & R
	Knob	46-1127	Volume Control (Models L1812R, L2229E)
	Knob	46-1187	Channel Selector (Models L1812R, L2229E)
	Knob	46-1198	Contrast Control (Models 1812E & R, L1820E & R)
	Knob	46-1052	Fine Tuning (Models L2229E & R, L2235E & R)
	Knob	46-1118	Horiz. Hold (Models L2229E & R, L2235E & R)
	Knob	46-1182	Vert. Hold & Brightness (Models L2229E & R, L2235E & R)
	Knob	46-1126	Volume control (Models L1812E, L2229R)
	Knob	46-1186	Channel Selector (Models L1812E, L2229R)
	Knob	46-1199	Contrast control (Models L2229E & R, L2235E & R)
	Knob	46-1194	Volume control (Models L1820R, L2235R)
	Knob	46-1188	Channel Selector (Models L1820R, L2235R)
	Knob	46-1195	Volume control (Models L1820E, L2235E)
	Knob	46-1189	Channel Selector (Models L1820E, L2235E)
	Knob	46-1217	Pull-for sound box (Models L1820R, L2235R)
	Knob	46-1216	Pull-for sound box (Models L1820E, L2235E)
	Cabinet Back	S-18917	(Models L1812E & R, L1820E & R)
	Cabinet Back	S-19819	(Models L2229E & R, L2235E & R)
	Safety Glass	192-151	(Models L1812E & R, L1820E & R)
	Safety Glass	192-168	(Models L2229E & R, L2235E & R)



FINE TUNING DRIVE CORD STRINGING

TROUBLE SHOOTING AIDS (cont)

OF
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POWER

DEAD SET

If filaments fail to light, check AC interlock, switch on volume control and T1. If filaments light, check V18 and B+ filter and decoupling network components.

SMALL AND/OR DIM PIX

Substitute V18. Check B+ filter and decoupling network components.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check fuse, M1. Check by substitution V14, V15, V16 and V17. Check waveform W16.

If Satisfactory	If Unsatisfactory
Check R88, T2, T4A, R85, R86, C59 and other associated components.	Check C56, C57, C58, C53, C54, C55, R80, R82, R83, R76, R78 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V14, V15, V16, V17 and V18. Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V14, V15, V16, V17 and V18. Check R88, T2, T4A, R85, R86, C59, picture tube and other associated circuit components.

GENERAL

RASTER SOUND NO PIX

See "Loss of Video".

RASTER NO SOUND NO PIX

Check by substitution V1, V2, V3, V4, V5 and V6. Check video detector assembly. Check components associated with these stages.

NO RASTER NO SOUND

See "Dead Set".

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this receiving equipment.

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the RF tuner oscillator circuit, it is necessary to remove the rear cover and supply power to set. Adjustments are made through the hole marked "Bull's Eye Adjustment" and are accessible one at a time as the selector switch is turned to that channel (fine tuning control must be set in the center of its range before making adjustments. (Use alignment wrench 68-21).

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3924 MEADE ST.
DENVER, COLORADO

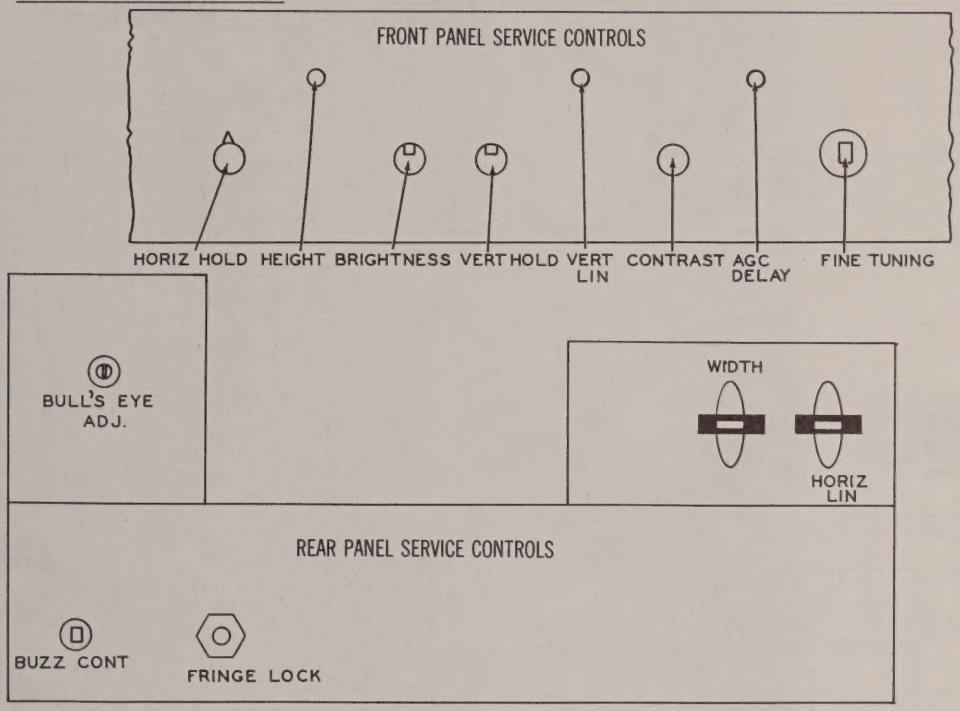
PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



SPECIAL ADJUSTMENTS - FRINGE LOCK ADJUSTMENT

Turn the fringe lock control to 1/4 turn from full clockwise position. Adjust the vertical and horizontal hold for picture synchronization and check stability by switching off channel and back again. Slightly retouch the fringe lock control adjustment, if necessary, for maximum stability while testing as above.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the front panel service control, adjust the horizontal hold control (L18) until picture synchronizes horizontally.

SOUND IF DETECTOR ADJUSTMENT

Adjust the buzz control located on rear apron of chassis for maximum vlome and minimum buzz. If results are unsatisfactory see alignment instructions on pages 6 and 7.

FUSES

One fuse is used for horizontal sweep protection. (See tube placement chart, for location).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

ANTI-PIN CUSHION CORRECTION

Adjust the vertical and horizontal size controls so that the corners and sides of the picture are visible. Bend the corrector magnet arms for right angle corners and until opposite sides of the picture are parallel and straight. Restore the picture to normal size.